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FINAL
RECORD OF DECISION

FOR
BONNEVILLE POWER ADMINISTRATION
ROSS COMPLEX
OPERABLE UNIT A

April 27, 1993



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67981

DECLARATION

BONNEVILLE POWER ADMINISTRATION ROSS COMPLEX VANCOUVER, WASHINGTON RECORD OF DECISION

SITE NAME AND LOCATION

Bonneville Power Administration, Ross Complex
Vancouver, Washington

STATEMENT OF PURPOSE

This decision document presents the selected remedial action for Operable Unit A, one of two operable units, of the Bonneville Power Administration (BPA) Ross Complex Superfund site in Vancouver, Washington. This document was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Contingency Plan (NCP). This Record of Decision is based on the administrative record for this site.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response actions selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE REMEDY

The selected remedies for Operable Unit A (OUA) address the risk posed by the soil contamination at the site by removing and/or treating soil contamination to levels that are protective of human health and the environment and comply with Applicable or Relevant and Appropriate Requirements (ARARs).

Remedial Action is required at the Wood Pole Storage Area East, the Ross Substation and Capacitor Yard and the Capacitor Testing Lab.

The major components of the selected remedies under this ROD include:

- Excavation of contaminated soils at the Ross Substation and the Capacitor Yard and the Capacitor Testing Lab;

- Off-site disposal of contaminated soils from the Ross Substation and Capacitor Yard and the Capacitor Testing Lab at a TSCA approved landfill;
- On-site enhanced bioremediation treatment of contaminated soil plus capping and institutional controls if necessary at the Wood Pole Storage Area East, and;
- Confirmation soil sampling and analysis to ensure that remediation goals have been met.

Removal actions have been completed at a number of waste units throughout OUA to satisfy state requirements. Additional remedial action under CERCLA is not necessary at the remaining waste units because contaminant concentrations found in the soil do not pose an unacceptable risk to human health or the environment consistent with the NCP.

DECLARATION

The selected remedies are protective of human health and the environment, comply with Federal and State requirements that are legally applicable or relevant and appropriate requirements to the remedial action and are cost-effective. These remedies use permanent solutions and alternative treatment technology to the maximum extent practicable, and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility or volume as a principle element.

A five year review will not be required at the Capacitor Testing Lab since hazardous substances will not remain on-site above health-based levels. A five year review will be required at the Ross Substation and Capacitor Yard. There is a contingency built into the bioremediation remedy for the Wood Pole Storage Area East whereby hazardous substances that exceed the remedial action objectives may be left on site and capped. In that case, a five year review will be required.

 May 5, 1993

David Dunahay
Bonneville Power Administration
Ross Complex Manager

Date

Signature sheet for the foregoing Operable Unit A, Bonneville Power Administration, Ross Complex Record of Decision between the U.S. Department of Energy, Bonneville Power Administration, Ross Complex and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Dana A. Rasmussen 5/6/93

Dana A. Rasmussen

Date

Regional Administrator, Region 10

United States Environmental Protection Agency

Signature sheet for the foregoing Operable Unit A, Bonneville Power Administration, Ross Complex Record of Decision between the U.S. Department of Energy, Bonneville Power Administration, Ross Complex and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Carol L. Fleskes April 30, 1993

Carol Fleskes, Program Manager
Toxics Clean-up Program
Washington State Department of Ecology

Date

TABLE OF CONTENTS (CONTINUED)

<u>Section</u>	<u>Page</u>
6.4 NATURE AND EXTENT OF CONTAMINATION	16
7.0 SUMMARY OF SITE RISKS	29
7.1 COMPOUNDS OF CONCERN AND USE OF DATA	34
7.2 HUMAN HEALTH RISK ASSESSMENT	35
<u>7.2.1 Exposure Assessment</u>	35
7.2.1.1 Site Setting	35
7.2.1.2 Potentially Exposed Populations	36
7.2.1.3 Identification of Exposure Pathways	39
<u>7.2.2 Toxicity Assessment</u>	39
7.2.2.1 Non-Carcinogenic Effects	39
7.2.2.2 Carcinogenic Effects	39
<u>7.2.3 Risk Characterization</u>	40
7.2.3.1 Evaluation of On-Site Risks	40
7.2.3.2 Evaluation of Off-Site	44
<u>7.2.4 Uncertainty</u>	44
7.3 ECOLOGICAL RISK ASSESSMENT	46
<u>7.3.1 Risk Characterization</u>	46
8.0 REMEDIATION GOALS	49
9.0 DESCRIPTION OF ALTERNATIVES	50
9.1 ALTERNATIVE A: NO ACTION	50
9.2 ALTERNATIVE B: INSTITUTIONAL CONTROLS	51
9.3 ALTERNATIVE C: EXCAVATION WITH OFF-SITE DISPOSAL	51
9.4 ALTERNATIVE D: ASPHALT CAPPING WITH INSTITUTIONAL CONTROLS	51
9.5 ALTERNATIVE F: KPEG (POTASSIUM POLYETHYLENE GLYCIL) DECHLORINATION	51
9.6 ALTERNATIVE G: SOIL WASHING	52
9.7 ALTERNATIVE H: BEST® EXTRACTION	52
9.8 ALTERNATIVE I: EX-SITU SOLID PHASE BIOREMEDIATION	52
9.9 ALTERNATIVE J: THERMAL TREATMENT WITH OFF-SITE DISPOSAL	52
9.10 ALTERNATIVES RETAINED FOR DETAILED EVALUATION	52
10.0 COMPARATIVE ANALYSIS OF ALTERNATIVES	53
10.1 <i>COMPARATIVE ANALYSIS FOR WOOD POLE STORAGE AREA EAST</i>	55
10.1.1.1 Overall Protection of Human Health and the Environment	55
10.1.1.2 Compliance with ARARs	55
<u>10.1.2 Primary Balancing Criteria</u>	56

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 INTRODUCTION	1
2.0 SITE LOCATION AND DESCRIPTION	1
2.1 SITE LOCATION	1
2.2 CURRENT LAND USE	3
3.0 SITE HISTORY AND ENFORCEMENT ACTIONS	3
3.1 SITE HISTORY	3
3.2 INITIAL INVESTIGATIONS	3
3.3 REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)	3
<u>3.3.1 Fog Chamber Dump</u>	6
<u>3.3.2 Wood Pole Storage Area South</u>	6
<u>3.3.3 DOB-1 Drain Line</u>	6
<u>3.3.4 DOB-2 Drainfield</u>	6
<u>3.3.5 Top Coat Test Area</u>	7
<u>3.3.6 Capacitor Testing Lab</u>	7
<u>3.3.7 Paint Storage Facility</u>	7
<u>3.3.8 Paint Shop ("Plumbing Shop")</u>	8
<u>3.3.9 Sandblasting Area</u>	8
<u>3.3.10 Van's Way Oil Storage Area</u>	8
<u>3.3.11 Wood Pole Storage Area East</u>	8
<u>3.3.12 Ross Substation and Capacitor Yard</u>	9
<u>3.3.13 U&D Yard</u>	9
<u>3.3.14 Hazardous Waste Storage Building</u>	9
<u>3.3.15 Herbicide Storage Area</u>	10
<u>3.3.16 Untanking Tower</u>	10
<u>3.3.17 Laboratory Waste Storage</u>	10
<u>3.3.18 PCB Storage Building</u>	10
<u>3.3.19 Cold Creek Fill</u>	11
<u>3.3.20 Eight Oil/Water Separators</u>	11
<u>3.3.21 Temporary Paint Storage Area</u>	11
<u>3.3.22 Ellen Davis Trail</u>	11
4.0 COMMUNITY RELATIONS	12
4.1 COMMUNITY RELATIONS DURING THE RI/FS	12
4.2 COMMUNITY RELATIONS TO SUPPORT SELECTION OF REMEDY	12
5.0 SCOPE AND ROLE OF RESPONSE ACTION WITHIN SITE STRATEGY	13
6.0 SUMMARY OF SITE CHARACTERISTICS	15
6.1 PHYSICAL SETTING	15
6.2 GEOLOGICAL SETTING	15
6.3 HYDROGEOLOGIC SETTING	16

TABLE OF CONTENTS **(CONTINUED)**

<u>Section</u>	<u>Page</u>
10.1.2.1 Long-Term Effectiveness and Permanence	56
10.1.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment . . .	56
10.1.2.3 Short-Term Effectiveness	56
10.1.2.4 Implementability	57
10.1.2.5 Cost	57
<u>10.1.3 Modifying Criteria</u>	58
10.1.3.1 State Acceptance	58
10.1.3.2 Community Acceptance	58
10.2 ROSS SUBSTATION AND CAPACITOR YARD	58
<u>10.2.1 Threshold Criteria</u>	58
10.2.1.1 Overall Protection of Human Health and the Environment	58
10.2.1.2 Compliance with ARARs	59
<u>10.2.2 Primary Balancing Criteria</u>	60
10.2.2.1 Long-term Effectiveness	60
10.2.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment . . .	60
10.2.2.3 Short-Term Effectiveness	61
10.2.2.4 Implementability	62
10.2.2.5 Cost	62
<u>10.2.3 Modifying Criteria</u>	62
10.2.3.1 State Acceptance	63
10.2.3.2 Community Acceptance	63
10.3 CAPACITOR TESTING LAB	63
<u>10.3.1 Threshold Criteria</u>	63
10.3.1.1 Overall Protection of Human Health and the Environment	63
10.3.1.2 Compliance with ARARs	64
<u>10.3.2 Primary Balancing Criteria</u>	64
10.3.2.1 Long-term Effectiveness	64
10.3.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment . . .	65
10.3.2.3 Short-Term Effectiveness	65
10.3.2.4 Implementability	66
10.3.2.5 Cost	66
<u>10.3.3 Modifying Criteria</u>	66
10.3.3.1 State Acceptance	67
10.3.3.2 Community Acceptance	67
11.0 SELECTED REMEDY	67
11.1 KEY ELEMENTS OF SELECTED REMEDY FOR WOOD POLE STORAGE AREA EAST	67

**TABLE OF CONTENTS
(CONTINUED)**

<u>Section</u>	<u>Page</u>
11.2 KEY ELEMENTS OF SELECTED REMEDY FOR ROSS SUBSTATION & CAPACITOR YARD	70
11.3 KEY ELEMENTS OF SELECTED REMEDY FOR CAPACITOR TESTING LAB ..	70
12.0 STATUTORY DETERMINATION	
12.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT	71
12.2 COMPLIANCE WITH ARARs	71
<u>12.2.4 Other Criteria, Advisories, or Guidance To-Be-Considered (TBC)</u>	72
12.3 COST EFFECTIVENESS	72
12.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES	72
12.5 PREFERENCE FOR TREATMENT AS PRINCIPAL ELEMENT	73
13.0 DOCUMENTATION OF SIGNIFICANT CHANGES	73

LIST OF TABLES AND FIGURES

Tables

Table 1 -	Waste Unit Designation
Table 2 -	Summary of Laboratory Soils Results
Table 3 -	Description and Summary of Human Receptor Groups (Residential and Occupational) Potentially Exposed to Operable Unit A Contaminants
Table 4 -	Estimated Hazard Quotients and Lifetime Cancer Risk, Hypothetical On-Site Residential and Occupational Receptors
Table 5 -	Estimated Hazard Quotients and Lifetime Cancer Risk, Off-site Recreational Receptors
Table 6 -	Compound-Specific Exposures; Contributions by Pathway
Table 7 -	Preferred Alternative Tier, Wood Pole Storage Area East

Figures

Figure 1 -	Site Location Map
Figure 2 -	Operable Unit A Site Plan
Figure 3 -	Distribution of Pentachlorophenol (PCP), Wood Pole Storage Area, East
Figure 4 -	Distribution of Total HPAH, Wood Pole Storage Area, East
Figure 5 -	Estimated Areas of Contaminated Soils, Wood Pole Storage Area, East
Figure 6 -	Distribution of Total PCB, Ross Substation and Capacitor Yard
Figure 7 -	Estimated Areas of Contaminated Soils, Ross Substation and Capacitor Yard
Figure 8 -	Distribution of Total PCB, Capacitor Testing Laboratory
Figure 9 -	Estimated Areas of Contaminated Soils, Capacitor Test Laboratory
Figure 10 -	Relationship of Screening Criteria

DECISION SUMMARY

1.0 INTRODUCTION

The Decision Summary provides a condensed description of the site-specific factors and analysis that led to the selection of the remedy for Operable Unit A (OUA) at the Bonneville Power Administration, Ross Complex Superfund site, beginning with the early identification and characterization of the problem (documented in the remedial investigation (RI)), proceeding through identification and evaluation of candidate remedial alternatives (documenting the feasibility study (FS)), and concluding with the remedy selected in this Record of Decision (ROD). The involvement of the public throughout the process is also described, along with the environmental programs and regulations that relate or direct the overall site remedy. The way in which the selected remedy meets Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the State of Washington Model Toxics Control Act (MTCA) requirements are also documented.

2.0 SITE LOCATION AND DESCRIPTION

2.1 SITE LOCATION

The BPA Ross Complex (referred to hereafter as the Site) consists of a 235-acre tract on the eastern side of U.S. Highway 99 and is bordered to the north by Cold Creek Canyon (Cold Creek), a Burlington Northern Railroad right-of-way, NE Minnehaha Street, and to the east and south by a residential neighborhood. Burnt Bridge Creek borders the Site to the southwest and west, and Highway 99 and Interstate 5 border the Site to the west (Figure 1). The Site address is 5411 NE Highway 99, Vancouver, Washington which is located in Clark County.

The Site is located approximately 2.7 miles north of the Columbia River and 1.7 miles east of Vancouver Lake. Two streams border the Site, with Cold Creek forming the north border of the Site and Burnt Bridge Creek bordering the southwestern side of the Site. Cold Creek, a tributary to Burnt Bridge Creek, flows into Burnt Bridge Creek just west of the Site. Burnt Bridge Creek flows into Vancouver Lake (Figure 1). The location of the creeks in relation to the Site is shown in Figure 2. Vancouver Lake is used for recreation purposes such as boating, swimming and fishing. The site does not lie within a 100 year flood plain.

Census tract information for the Vancouver area indicates moderate-density human habitation south of the Site, and low density habitation north of the Site. Approximately 18,000 residents live within a one-mile radius of the Site. This includes residents and businesses with workers occupying the area immediately to the east of the Site between St. Johns Ave. and St. James, residents between St. Johns Ave. and 19th St. (southeast of the Site), an area which includes several schools and churches; residents inhabiting the area between 19th St. and Leverich Park to the southwest of the Site (including a trailer park adjoining the Site boundary) and residents inhabiting the area north of the Site between the Cold Creek drainage and Minnehaha Avenue.

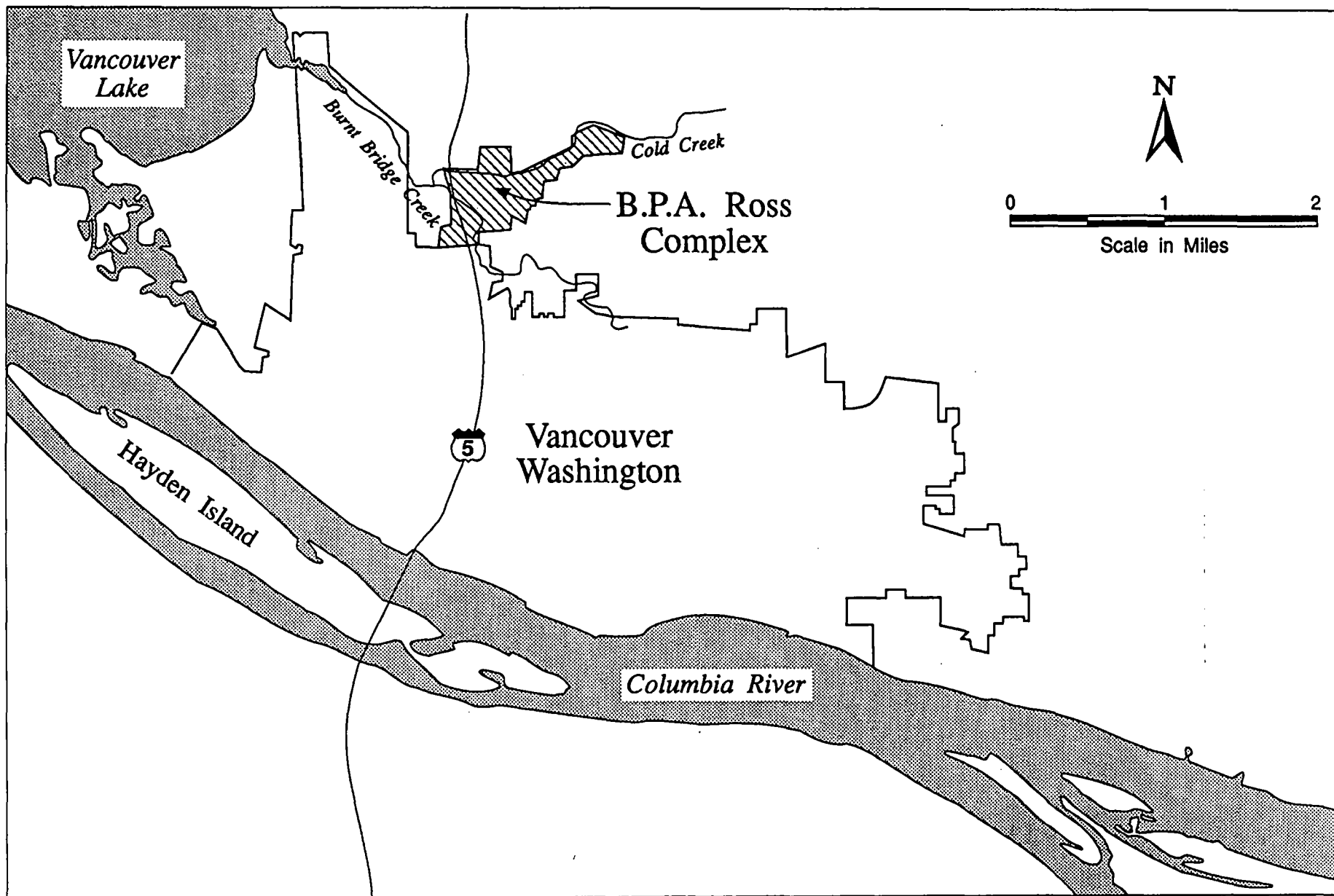


Figure 1. Site Location Map

2.2 CURRENT LAND USE

The Bonneville Power Administration (BPA) owns and operates a power distribution center known as the Ross Complex in Vancouver, Washington. The facility coordinates and distributes hydroelectric power generated by the Federal Columbia River Power System throughout the Pacific Northwest region. Since its construction in 1939, the Ross Complex has provided research and testing facilities; and maintenance, construction, operations, and waste handling and storage facilities for BPA. Research and testing focuses on evaluation of the durability of electrical storage and transmission equipment under various climatic and weather conditions. Equipment stored, maintained and repaired includes transformers, bushings and other electrical transmission and storage equipment.

3.0 SITE HISTORY AND ENFORCEMENT ACTIONS

3.1 SITE HISTORY

The Site is an active facility that has been owned and operated by the Bonneville Power Administration (BPA) since 1939 to distribute hydroelectric power generated from the Columbia River to regions throughout the Pacific Northwest. Since its construction, the Site has provided research and testing facilities, maintenance construction operations, and waste storage and handling operations for BPA. Maintenance activities at the Ross Complex have routinely involved handling transformer oils containing polychlorinated biphenyls (PCBs), and organic and inorganic compounds associated with the storage of preserved wood transmission poles, paints, solvents, and waste oils. Testing and laboratory activities include the use of heavy metals (such as mercury) and other organic and inorganic compounds.

The waste units investigated in the PA/SI and the OUA RI/FS are primarily the result of past waste handling practices at the Ross Complex. Some of these areas are no longer active; others continue to be used in current operations.

3.2 INITIAL INVESTIGATIONS

Five investigations were conducted at the Site between 1986 and 1990: a Preliminary Assessment (PA 1986), a Site Investigation (SI 1988), a soil gas survey and ground-water quality assessment (Weston, 1989), a preliminary hydrogeologic investigation (Dames & Moore, 1989), and a Vancouver Well Field Special Survey (E&E, 1990). BPA has also conducted numerous individual sampling programs in various areas of the Site. The findings of these investigations are summarized in detail in the "Remedial Investigation Report, Operable Unit A, Bonneville Power Administration, Ross Complex" dated May 15, 1992.

3.3 REMEDIAL INVESTIGATION/FEASIBILITY STUDY (RI/FS)

The Site was listed on the National Priorities List (NPL) in November 1989 based on the presence of volatile organic compounds (VOCs) in ground water and the Site's proximity to the City of Vancouver's drinking water supply. As a result of the listing, pursuant to a Federal Facility Agreement (FFA) signed by BPA, EPA, and the Washington Department of Ecology (Ecology) on May 1, 1990, BPA conducted a Remedial Investigation/Feasibility Study (RI/FS) to determine the nature and extent of contamination at the site and to evaluate alternatives for the cleanup of contaminated areas. The RI field investigation began in the summer of 1991 and included the collection and chemical analysis of soil, surface water, sediment, and groundwater samples. A total of twenty one individual areas of concern or "waste units" were identified for investigation based on historical chemical handling, storage and disposal practices and the results of previous

investigations. The waste units investigated included:

- | | |
|--|--|
| 1. Fog Chamber Dump Trench Areas 1 and 2 | 11. Wood Pole Storage Area East |
| 2. Wood Pole Storage Area South | 12. Ross Substation and Capacitor Yard |
| 3. DOB-1 Drain Line | 13. Utilization and Disposal Yard |
| 4. DOB-2 Drainfield | 14. Hazardous Waste Building |
| 5. Top Coat Test Area | 15. Herbicide Storage Area |
| 6. Capacitor Testing Lab | 16. Untanking Tower |
| 7. Paint Storage Facility | 17. Laboratory Waste Storage Area |
| 8. Plumbing Shop | 18. PCB Storage Area |
| 9. Sandblasting Area | 19. Cold Creek Fill |
| 10. Van's Way Oil Storage Area | 20. Oil/Water Separators (OWS1 through OWS8) |
| | 21. Temporary Storage Area |

Initially the RI was designed to address the entire Site but during the summer of 1991, BPA, EPA and Ecology decided that the Site would be divided into two separate operable units (Units A and B) to facilitate the CERCLA process. Operable Unit A is the investigation of soils in 19 of the 21 waste units, the Ellen Davis Trail, and the possible exposure from airborne contamination. The 19 waste units evaluated in Operable Unit A include: Wood Pole Storage Area South, DOB-2 Drainfield, DOB-1 Drain Line, PCB Storage Area, Capacitor Testing Lab, Hazardous Waste Building, Top Coat Test Area, Untanking Tower, Laboratory Waste Storage Area, Van's Way Oil Storage Area, Paint Storage Facility, Wood Pole Storage Area East, Plumbing Shop, Herbicide Storage Area, Ross Substation and Capacitor Yard, Oil/Water Separators (OWS1 through OWS8), Utilization and Disposal Yard, Sandblasting Area, and the Temporary Storage Area. This ROD addresses only OUA. Based on the evaluation of all these areas, the Wood Pole Storage Area East, the Ross Substation and Capacitor Yard and the Capacitor Testing Lab were selected for action in the OUA ROD.

Operable Unit B will focus on potential shallow and deep groundwater, surface water and sediment quality of Cold Creek and Burnt Bridge Creek, and subsurface soils investigation in the Fog Chamber Dump Trench Areas 1 and 2 and Cold Creek Fill.

An investigation of the Ellen Davis Trail (where the trail passes through the Site) was performed to evaluate potential risks to area residents who use the trail for recreational purposes. Waste unit locations and the Ellen Davis Trail are shown in Figure 2. Waste storage, handling, and disposal practices associated with each "waste unit" are described below.

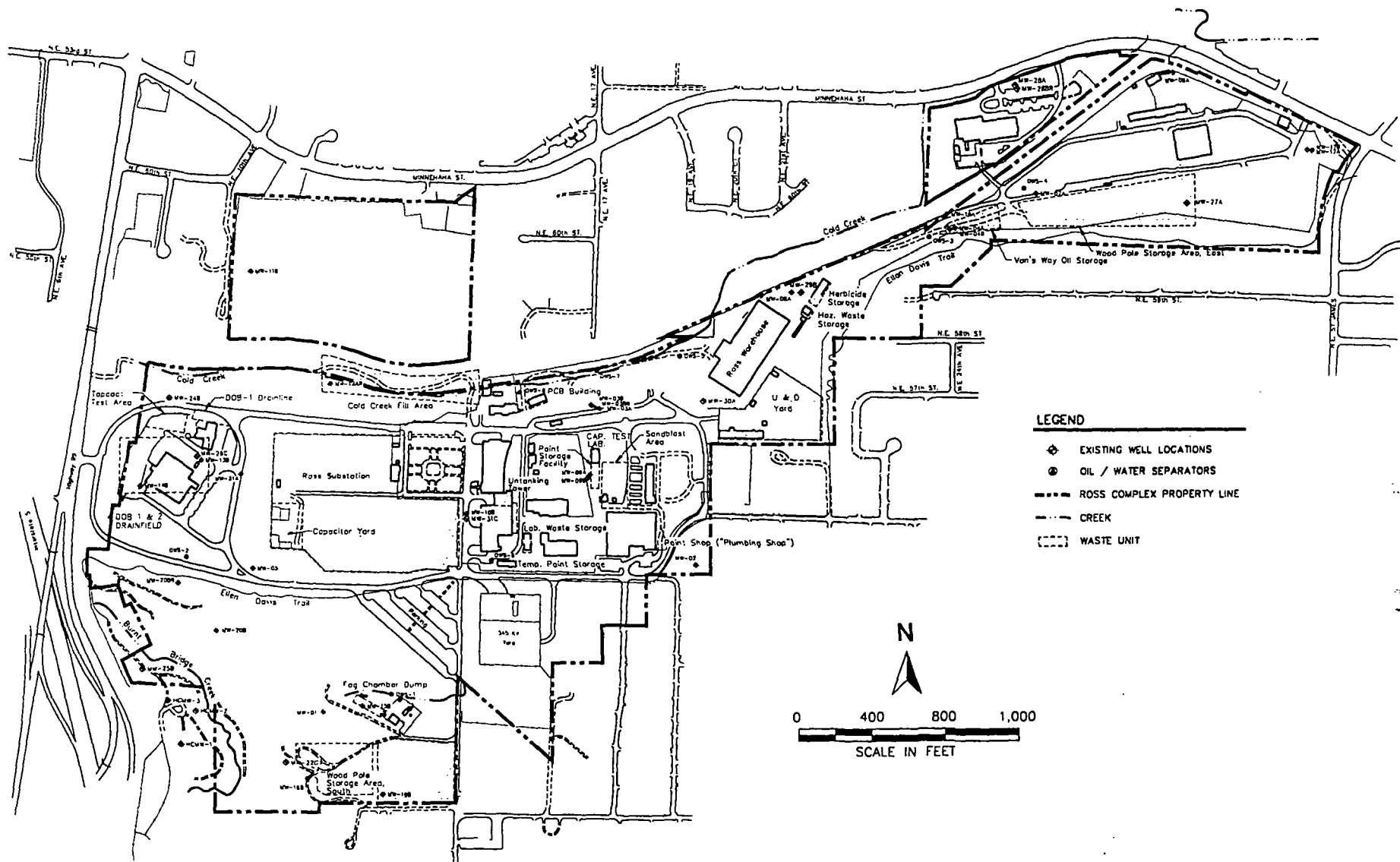


FIGURE 2
OPERABLE UNIT A SITE PLAN
BPA ROSS COMPLEX
DAMES & MOORE

3.3.1 Fog Chamber Dump

Trench Area 1

Trench Area 1 in the Fog Chamber Dump consisted of an open pit dump located in the present site of the Fog Chamber Test Facility. The Fog Chamber Dump is the only confirmed area on the Ross Complex where spent capacitors containing PCB oils have been disposed along with other assorted incidental solid wastes such as wood pallets, waste paper, and glass insulators. Reportedly these wastes were set on fire and allowed to burn. Historical aerial photographs indicate that an open pit approximately 12 feet by 120 feet with a depth of 20 feet existed between 1956 and 1960.

Trench Area 2

Aerial photographs dated 1942 and July 21, 1951, initially revealed the presence of six subparallel linear features in Trench Area 2 (located southeast of Trench Area 1) and appeared to represent closed spaced backfilled excavations or dirt roadways. A 1955 aerial photograph showed active grading areas and the presence of fill material which was most likely from the Ross Substation and Capacitor Yard and the 345 kV yard.

3.3.2 Wood Pole Storage Area South

The Wood Pole Storage Area South is located east of the Fog Chamber Dump, Trench Area 2. This area was used to store treated transmission poles before distribution throughout the Pacific Northwest. Historically, the poles were treated off-site with PCP and/or creosote as antibiotics to increase their longevity in the environment. The poles were stored on cross poles to keep them off the ground.

3.3.3 DOB-1 Drain Line

Operation of the BPA District Chemistry Laboratory in the DOB-1 building from approximately 1953 to 1978 resulted in the drainage of liquid hazardous materials to on-site disposal systems. The exact location and design of the disposal systems associated with this building have not been confirmed. The laboratory wastes disposed in this area are presumed to include hazardous chemicals, including mercury compounds, nitrobenzene, herbicides, pesticides, paints, thinners, PCP, chromic trioxide, sulfuric acid, lead, arsenic, and titrating solvents. Laboratory wastes were directed to a disposal system located south of DOB-1 prior to the construction of the Dittmer Building in 1970. The disposal system reportedly consisted of a dry well (or wells) connected to the laboratory by a buried 4-inch cast iron pipe which drained the laboratory sink system. This drainfield was reportedly separate from the sanitary drainfield that served the DOB-1 and DOB-2 building. The area where the dry well was supposedly located is presently covered by an asphalt access road north of the Dittmer Building. No specific documentation concerning the location of the dry well(s) or the possible drainfield was available. Construction of the new Dittmer Building and grounds in 1970 disrupted the area south of DOB-1 where the laboratory waste disposal area was supposedly located.

3.3.4 DOB-2 Drainfield

The DOB-1 and DOB-2 Sanitary Drainfield (referred to hereafter as the DOB-2 Drainfield) was located between and behind (west of) the two DOB buildings. This drainfield may have received liquid hazardous wastes from the chemical laboratory in DOB-1 building. The former DOB-1 lab was used to test transformer oils, top coat preservatives for transmission poles, herbicides, clean oil bottles and oily glassware. Chemicals that were either tested or used in the analytical testing laboratory include: inorganic chemicals;

acids (such as: nitric, hydrochloric, and sulfuric acids); bases (such as: sodium hydroxide); heavy metals (such as: lead, mercury, silver, zinc, copper and arsenic); organic chemicals (such as: PAHs, PCBs, PCP, creosote, chloroform, paint thinners, isopropyl alcohol, and acetone); solvents for titrating and TCE, TCA); and synthetic such as potassium dichromate and chromic trioxide. The exact location of the original chemical drain system from this laboratory is not known nor is its relationship to the sanitary drainfield that served both DOB-1 and DOB-2. It is possible the sanitary drainfield received the chemical laboratory waste until about 1970 when construction of the Dittmer Building disrupted the drainfield and ended its use.

Effluent from the chemical laboratory reportedly contained chromic trioxide and sulfuric acid, which were used to clean oily bottles and glassware over a 25-year period. Other constituents that may have contaminated the drainfield, but in smaller quantities, include mercury, lead, arsenic, silver, zinc, and copper. Typical organics that may have been released to the drainfield include nitrobenzene, herbicides, paint thinners, pentachlorophenol (PCP), and toluene.

A large proportion of the DOB-2 Drainfield was reportedly removed during construction of the Dittmer Building in 1970. The area now is almost entirely covered by the Dittmer Building and its asphalt parking lot.

3.3.5 Top Coat Test Area

The Top Coat Test Area was located behind (west of) the DOB-1 building and began operation in 1962. The purpose of this facility was to test wood transmission poles that had been treated with PCP formulations. Storage of drums containing spent transformer oils and other chemical wastes may also have caused some direct soil contamination in this area. The test poles were removed in 1969 just before construction of the Dittmer Building. Grading and other construction activities in this area may have caused mixing and/or removal of the contaminated surface soil to the Cold Creek Fill Area. The Top Coat Test Area was capped with an asphalt parking lot in 1973.

3.3.6 Capacitor Testing Lab

The Capacitor Testing Lab is located near the center of the Ross Complex. This facility is considered an operating facility but is no longer routinely used for capacitor testing and the use of the laboratory was discontinued in 1984. In the past, when the building was used to stress test capacitors, fluid containing PCBs spilled onto the concrete floor as well as onto the dirt and gravel beyond the garage door. According to a long-time BPA employee who worked in the area, capacitors were ruptured by short duration electrical arcing, which may have potentially produced heat. Stress testing of capacitors was conducted in two ovens located on stands near the east wall of the laboratory. Reportedly the capacitors were stressed to failure within the ovens and then the remains were removed and stored on the laboratory floor prior to disposal. PCB-containing oils were reportedly spilled on the floor during the removal of the capacitor remains from the oven and also leaked onto the floor during temporary storage of capacitors. The north wall of the laboratory area was reportedly removed when the building was converted to a storage area (after the laboratory was removed). The building is currently used for storage purposes.

3.3.7 Paint Storage Facility

Paints, paint thinners, fiberglass resin and hardener, ethanol, glycerine, white lime, insulating foam, asbestos, acetone and other materials have been stored in the southern half of the Paint Storage building. The northern half of this building was the Capacitor Testing Lab. Based on aerial photographic evidence a building was constructed to house the Paint Storage Facility and the Capacitor Testing Lab between 1952 and

1956. The Paint Storage Facility occupied the southern two-thirds and the Capacitor Testing Lab occupied the northern one-third of the building.

3.3.8 Paint Shop ("Plumbing Shop")

Two underground storage tanks were removed from the Paint Shop ("Plumbing Shop") area near the southeastern corner of the building in June 1987. The tanks were actually located near the northeast corner of the Plant Services Building opposite the Paint Shop (Building Z 671). One of the tanks had a capacity of 500 gallons and was used to store "Socal II" paint solvent. The second tank had a capacity of 1,000 gallons and was used to store lacquer thinner. Spillage occurred when an employee was filling a 55-gallon drum with an electric pump from the underground storage tank. The tanks and surrounding soils were eventually removed and samples collected to assess the success of the remediation. Soils, west of the tanks, that extend under the foundation of the Plant Services Building were not removed for fear of losing structural support.

The area of the former tank nest is currently paved with asphalt. Solvent reclaiming equipment is currently located west of the former tank location along the outside building wall.

3.3.9 Sandblasting Area

The Sandblasting Area is located between the plasma torch building and the Capacitor Testing Lab and was used for approximately 7 years for sandblasting trailers, transformers, cranes, underground storage tanks, circuit breakers, and other equipment to remove corrosion and paint before repainting. This area is no longer used for sandblasting. Some of the equipment originally may have been coated with lead paint. The sandblasting waste, which consists of relatively clean medium- to coarse-grained sand, formed an approximately 4-inch thick layer on the ground in the heavily used area. The waste reportedly has been spread beyond the area where sandblasting was performed by truck traffic and wind dispersal. Sandblasting of small to medium sized equipment (eye beams, pipes, etc.) is performed inside the southern portion of the plumbing shop. Garnet sand, which is used inside the building, has collected on the shop floor and is visible on the road outside the building door, behind the building, and in and around a hopper beneath an air filter apparatus outside the building.

3.3.10 Van's Way Oil Storage Area

The Van's Way Oil Storage Area was an above-ground tank storage facility. This facility contained tanks used for storage of insulating and other oils before distributing them to areas within the BPA system. Oils stored in the tanks contained less than 50 ppm PCBs. When in operation, 41 storage tanks were present with a combined capacity of 185,250 gallons. Some incidental spillage was evident near the tank drain spouts. Solvents are believed to have been used in the past to clean equipment in the area. Surface runoff from this site is directed through oil/water separators before release into Cold Creek.

3.3.11 Wood Pole Storage Area East

The Wood Pole Storage Area East is located on the eastern edge of the Ross Complex. This area is used to store treated transmission poles before distributing them to points throughout the Pacific Northwest. Waste storage, handling, and disposal practices for this area are the same as for the Wood Pole Storage Area South.

3.3.12 Ross Substation and Capacitor Yard

The Ross Substation is located in the central portion of the facility, to the east of Area B. The substation is built on a flat-topped hill which slopes very steeply approximately 20 to 30 feet to the south, west and north. The ground surface is covered in gravel to varying depths throughout the substation. Most of the oils in transformers currently in the substation are reported to contain less than 500 ppm PCBs. Equipment that contains oil including transformers and circuit breakers is located within the approximately 10-acre fenced area.

The Capacitor Yard is located in the southwestern corner of the substation. There are 6,002 capacitors in the Capacitor Yard. Many of the capacitors contain oils with PCB concentrations ranging from approximately 5,000 to 6,000 ppm PCBs. On average, the capacitors have a capacity of about 2 to 3 gallons. Spills of PCB oils from faulty capacitors and leaking equipment have occasionally occurred within the substation.

Faulty capacitors and oil-filled equipment have released PCB-containing oils into the underlying graveled surface. Surface runoff is channeled through oil/water separators before exiting the Complex. BPA records indicate that small spills of PCB oils occurred in the Capacitor Yard in August, 1989. Chlorinated solvents were used extensively within the Capacitor Yard and to a lesser degree throughout the substation area to clean up oil spills, particularly in areas around circuit breaker pads and power pads.

Underground pipes, which are now abandoned, were used to transfer oil from six existing storage tanks near the Oil House to circuit breakers. An underground storage tank was removed near the Oil House in June 1987 and found to have leaked diesel fuel. When the underground pipes were abandoned, the lines were capped and the above ground fixtures were removed, although the pipes are still underground.

3.3.13 U&D Yard

The Utilization and Disposal Yard (U&D Yard) is used for the temporary storage of materials before their final disposition. Temporary storage of capacitors started in 1962 in an area 40 by 60 feet in the southeast corner of the U&D Yard. Oils which potentially may have contained low concentrations of PCBs were reportedly sprayed on the ground surface for dust control throughout the yard. In the mid-1970s, the entire yard was paved with asphalt after 3,500 cubic yards of soil potentially contaminated with PCBs and oils (equivalent to 6 inches over the entire yard) had been removed and disposed of at the Cold Creek Fill Area. Soil samples collected in 1984 along the fenced perimeter of this yard indicated only limited migration (at trace levels) of PCBs from the former capacitor storage area. BPA records describe an oil spill that occurred in August, 1987 in the U&D Yard. The spill was cleaned up with an organic solvent.

3.3.14 Hazardous Waste Storage Building

The Hazardous Waste Storage Building is currently used for the storage of solid and liquid hazardous wastes before shipment, including, but not limited to degreasing solvents, PCP, and inorganic acids. The maximum inventory of the building is 224 55-gallon drums, or 12,320 gallons of waste contained in drums. Waste drums are stored on wooden pallets and may be stacked two high. Four or less drums are secured to each pallet. The Hazardous Waste Storage Building is bermed and measures 38 feet 5 inches by 31 feet 9 inches inside of the curbing. Pavement near the loading areas has been treated with an impermeable emulsifier. No significant spills or leaks from these areas are known to have occurred.

3.3.15 Herbicide Storage Area

Herbicides and PCP-contaminated spill cleanup debris are currently stored in the flammable materials storage building (Z-814) (Figure 2). This building has three sloped storage bays that are connected to a 2,000-gallon underground tank used for spill control. Information obtained from BPA files indicate that a variety of herbicides were stored and/or applied at the Site.

3.3.16 Untanking Tower

The Untanking Tower is located between the north and south Ampere buildings and is used for the maintenance of large electrical equipment including transformers. Solvents have reportedly been used extensively in the building for cleaning oils and grease from equipment. Six above ground tanks are located directly to the east of the building.

3.3.17 Laboratory Waste Storage

Wastes generated at the new chemical laboratory located in the South Ampere building are stored in a shed designed for flammable materials. The storage shed is located in the parking lot near the east side of the building. Waste materials include spent-oil samples, transformer oil, PCB samples, spent-chlorinated solvents (TCA), waste iso-octane, and anon-pyridine reagent. Prior to 1986 drums were used to store the laboratory wastes. The use of drums for laboratory waste storage was discontinued and use of the storage shed began in approximately 1986 due to a reduction in volume of waste generated by the laboratory. This area was paved around 1986 prior to the use of the storage shed for laboratory waste storage.

A second, smaller shed for flammable materials storage is also located on the east side of the Ampere Building. The smaller storage shed belongs to the Instrument Services group. This shed was reported to have been used to store a variety of chemicals including ether, gasoline, 1,1,1-trichloroethane, ethylene glycol, ultrasonic cleaning solvents, containers of gasoline, motor oil, trichloroethane, Scotch Grip Solvent No. 2, Shell Donax Oil T-5, KS 7470 Oil, and alcohol (isopropyl).

3.3.18 PCB Storage Building

The PCB Storage Building has been in operation since 1972 and houses transformers and capacitors containing PCBs, as well as large tanks used to contain oils with over 50 ppm PCBs. Some PCB transformers, capacitors, and other electrical equipment may have been stored outside of the PCB Storage Building. The PCB Storage Building is internally curbed and the cement floor was originally sealed with an impermeable coating. The coating was reapplied in September, 1990. This area has also been used as a loading and unloading area for hazardous wastes. The major portion of the area to the east has been recently paved; the area south of the building is also paved. Oil-stained gravels have been observed in an area directly behind the building where bushings are currently stored. Solvents were reportedly dumped down a storm drain in front of the storage building in the past.

Chlorinated solvents were used heavily in the repair shop located to the west of the storage building (Building Z-992) and may have been disposed of in a storm sewer leading from the west side of the building to Cold Creek.

3.3.19 Cold Creek Fill

The Cold Creek Fill Area is a former landfill in Cold Creek Valley along the northern boundary of the Ross Complex. Cold Creek runs through a culvert covered by fill to a depth of 30 to 80 feet. In the past, fill materials came primarily from construction activities on the Complex. In later years, use of the fill area was limited to excess soils that had been tested for PCBs. These excess soils included excavated soils from the Dittmer Building construction (including DOB-1 and DOB-2 Sanitary Drainfield). A second source of potentially contaminated fill came from graded material associated with paving of the Utilization and Disposal Yard. Approximately 3,500 cubic yards of soil potentially contaminated with oils and PCBs were excavated and disposed as fill at this area. Evidence of spent sandblasting materials potentially containing heavy metals has also been found.

Another potential source of fill may have been from the grading of the Top Coat Test Area. The Top Coat Test Area was partially excavated and removed to accommodate the new Dittmer Building in 1969-1970. The excavated materials were reportedly dumped in the Cold Creek Fill Area. The excavated soils may have been contaminated with PCP formulations and metals used to test wood poles at the Top Coat Test Area.

3.3.20 Eight Oil/Water Separators

Eight oil/water separators, designated OWS-1 through OWS-8, are located throughout the Site. Storm water runoff from the site is collected in the oil/water separators where oily substances are retained before discharge of the water to Cold Creek, Burnt Bridge Creek, or to open ditches. The oil/water separator tank bottoms are located 14 to 20 feet below ground surface.

The outflow from Oil/Water Separator #1 empties to an unlined ditch north of the Fog Chamber Dump that drains to the west. Water from the unlined ditch is absorbed into underlying soils by percolation. The outflow of Oil/Water Separator #2 flows to the southwest through a culvert to Burnt Bridge Creek. Oil/Water Separators #3, #5, #7, and #8 discharge water to Cold Creek through culverts. Design drawings for Oil/Water Separator #6 are unavailable, and the outflow is not clearly defined.

Oil/Water Separator #4 was specially designed in 1988 to contain oil from a potential major spill or leak associated with the above-ground tank farm at the Vans Way Oil Storage Area. Fluids are stored and recycled through two holding tanks, and then discharged to Oil/Water Separator #3 where they are processed a second time before draining to Cold Creek.

3.3.21 Temporary Paint Storage Area

The Temporary Paint Storage Building, also known as the Paint Shop Annex, was formerly located immediately east of the South Ampere Building. Aerial photographs indicate it was constructed in the early 1940's and torn down around 1977. The Temporary Storage Building was used to prepare materials for painting and solvents, paint thinners and caustic solutions were stored in and around the building. Some materials were dipped in the caustic solution prior to painting. The use of caustic solutions were reportedly discontinued and replaced by sandblasting which was conducted in an open faced structure attached to the north end of the Temporary Paint Storage Building.

3.3.22 Ellen Davis Trail

The Ellen Davis Trail is an independent area of investigation near on site waste units. The Ellen Davis Trail extends approximately 1.75 miles from St. James Avenue east of the Site to Leverich Park south

of the Site. The majority of the trail was constructed in the late 1980's, although some portions of the trail are still being constructed. The trail follows the southern Site boundary and cuts across BPA property south of the Ross Substation. Use of the trail is open to the public.

4.0 COMMUNITY RELATIONS

Following the completion of the site investigation in July 1988, three fact sheets were mailed to the public in April and May 1990 which described the listing of the site on the National Priorities List (NPL) and the CERCLA process and associated schedule that BPA would undertake.

On May 1, 1991, a community relations plan (CRP) was prepared by BPA's Community Relations Group in accordance with CERCLA, as amended by SARA. The CRP included establishing information repositories and communication pathways to disseminate information. Information repositories are located at both the Ross Complex and in the Vancouver Regional Library, 1007 East Mill Plane Boulevard, Vancouver, Washington 98663.

4.1 COMMUNITY RELATIONS DURING THE RI/FS

An administrative record was established to provide the basis for selection of the remedial action in accordance with section 113 of CERCLA. The administrative record is available for public review at the Ross Complex or the Vancouver Regional Library. During the RI/FS, BPA issued a press release and five additional fact sheets. The chronology of the community relations is listed below.

- May 22, 1990 A scoping meeting was held to provide information to the public and hear concerns about environmental conditions at the site.
- July 1990 Fact sheet No. 4 described the results of the May scoping meeting.
- March 1991 Fact sheet No. 5 described chronology of events and the work plan for the RI/FS.
- May 1991 Fact sheet No. 6 described the RI and FS programs and current site work.
- August 1991 Fact sheet No. 7 described status of the RI field work.
- May 1992 Fact sheet No. 8 defined Operable Units A and B, discussed OUA RI and risk assessment findings, and activities planned for the summer of 1992.

4.2 COMMUNITY RELATIONS TO SUPPORT SELECTION OF REMEDY

The public was given the opportunity to participate in the remedy selection process in accordance with sections 117 and 113(k)(2)(B) of CERCLA. The proposed plan for Operable Unit A, which summarized the alternatives evaluated and presented the preferred alternative, was mailed to approximately 800 interested parties on August 14, 1992. BPA provided public notice through a display ad in the Columbian and Oregonian on August 24, 1992 to explain the proposed plan, list the public comment period, and announce the public meeting. Press coverage was also provided in the local news media which resulted in a news article of August 20, 1992.

A 30-day public comment period was held from August 14 to September 14, 1992. Approximately 20 people attended a public meeting, which was held on September 2, 1992 at the Ross Complex, DOB Auditorium. Thirty-nine verbal comments received at the public meeting and four written comments are included in the attached Responsiveness Summary.

Copies of the ROD and the Responsiveness Summary will be placed in the administrative record and in the information repositories.

5.0 SCOPE AND ROLE OF RESPONSE ACTION WITHIN SITE STRATEGY

The OUA RI evaluated the nature and extent of contamination in soil in 21 waste units and the Ellen Davis Trail. Results from the Baseline Risk Assessment indicate that a CERCLA remedial action is necessary for contaminated soil located in three areas of concern, Wood Pole Storage Area East, the Ross Substation and Capacitor Yard, and the Capacitor Testing Lab. Table 1 summarizes the Operable Unit A waste unit regulatory categorization. RI results indicate that high molecular weight polycyclic aromatic hydrocarbon (HPAHs) contamination in the Wood Pole Storage Area East and polychlorinated biphenyl (PCB) contamination in the Capacitor Testing Lab and the Ross Substation and Capacitor Yard exceed health-based levels and will require remediation as outlined in this ROD. The final remedial actions selected in this ROD address the removal and destruction of contaminants. Additional sampling and analysis will be conducted to determine if the contaminants were removed.

The final selected remedies include: (1) excavation and off-site disposal of PCB contaminated soil in the Capacitor Testing Lab and Ross Substation and Capacitor Yard; (2) enhanced bioremediation of HPAH and pentachlorophenol contaminated soil in the Wood Pole Storage Area East; (3) monitoring during bioremediation to evaluate if contaminants have been removed and/or are degrading overtime; and (4) soil sampling and analysis to ensure that remediation goals have been met.

The results of the RI indicated that metals, HPAHs, PCBs, and/or volatile organic compounds were present in seven individual waste units and that they exceeded soil cleanup levels promulgated under MTCA. These compounds were not laterally or vertically extensive but were present only in individual spot locations. EPA determined that the contaminants found did not present an unacceptable risk to human health and the environment in accordance with CERCLA. However, Ecology determined these exceedences were actionable under MTCA. BPA undertook removal actions in the areas listed in Table 1. There was no need for action in ten of the waste units.

Operable Unit B will focus on potential shallow and deep groundwater, surface water and sediment quality of Cold Creek and Burnt Bridge Creek, and subsurface soils investigation in the Fog Chamber Dump Trench Areas 1 and 2 and the Cold Creek Fill. The RI/FS for Operable Unit B will be completed in the spring of 1993. The Proposed Plan for Operable Unit B is scheduled for release in June 1993 and the draft Record of Decision is scheduled for August 1993.

Table 1
Waste Unit Designation
Operable Unit A
BPA Ross Complex RI

No Further Action Required Under CERCLA	Soil Contamination Addressed by Removal Action	Further Action Required Under CERCLA
DOB-1, DOB-2 Drainfields	Sandblasting Area	Ross Substation/Capacitor Yard
Top Coat Test Area	Lab Waste Storage	Wood Pole Storage Area East
Van's Way Oil Storage Area	Wood Pole Storage Area South	Capacitor Testing Laboratory
Utilization & Disposal Yard	Hazardous Waste Storage Building	
Herbicide Storage Area	Paint Shop	
Paint Storage Facility	Untanking Tower	
Temporary Paint Storage	DOB-1 Drainline	
PCB Storage Building		
Wood Pole Storage Area South		
DOB-1 Drainline		
Sandblasting Area		
Laboratory Waste Storage Area		
Hazardous Waste Storage Building		
Paint Shop		
Untanking Tower		
Ellen Davis Trail		
Oil Water Separators (8)		

6.0 SUMMARY OF SITE CHARACTERISTICS

6.1 PHYSICAL SETTING

The Site is located on an ancient alluvial terrace. Creeks and streams in the area have been cutting into the terrace deposits, creating incised channels. Elevations across the Site range from greater than 250 feet above mean sea level to approximately 40 feet above mean sea level. The surface gradient generally slopes to the west across the Site, with localized steep slopes toward Cold Creek to the north and Burnt Bridge Creek to the southwest (Figure 1). Two streams border the Site, with Cold Creek forming the north border of the Site and Burnt Bridge Creek bordering the southwestern side of the Site. Cold Creek, a tributary to Burnt Bridge Creek, flows into Burnt Bridge Creek just west of the Site. Burnt Bridge Creek flows into Vancouver Lake (Figure 1). The location of the creeks in relation to the Site is shown in Figure 2. Site stormwater runoff is directed through oil/water separators and then drains to either Cold Creek or Burnt Bridge Creek.

No wetlands were found at the Site. Several wetlands were observed west of the Site along Burnt Bridge Creek near Vancouver Lake. These include a palustrine-emergent wetland and a palustrine open-water wetland that are hydrologically connected to Burnt Bridge Creek. There were no threatened or endangered species observed at the Site or adjacent to the site.

A site survey to determine the presence of historic structures or features was performed in 1987. Four sites were found to be eligible for historic nomination; the Control House, Oil House, Switching Yard and the landscaping around the Control House and Oil House. None of the sites have been nominated and no site has been listed in national, state, or local preservation registers.

6.2 GEOLOGICAL SETTING

The Site is located on terraces that range in elevation from 40 feet to more than 250 feet above mean sea level (msl). The western two-thirds of the Site occupies an east-west trending ridgeline. The ridgeline slopes to the west with a moderately steep flank slope to the north towards Cold Creek. It also has a moderately steep slope to the southwest towards Burnt Bridge Creek. The eastern third of the Site occupies a valley averaging about 240 feet above msl with gently sloped sides. This valley drains to the west into Cold Creek.

Geologically, the Site rests on Pleistocene alluvial deposits in the Fourth Plains area of Clark County (Walsh et al, 1987). The Pleistocene deposits consist of 110 to greater than 177 feet of unconsolidated Pleistocene-aged sands, silts, and clays underlain by moderately consolidated Upper Troutdale Formation silty, sandy, or clayey gravels. The Upper Troutdale Formation underlies the Pleistocene deposits. The Upper Troutdale Formation is characterized by gravelly deposits as opposed to finer grained deposits of the Pleistocene-aged materials. The contact between the Troutdale and the younger Pleistocene sediments appears to be an erosional unconformity. The unconformity is expressed by a change in elevation of the contact across the Site. The subcrop or surface of the Troutdale Formation is encountered in borings ranging from 14 to 110 feet msl or 110 to 164 feet below ground surface (bgs). The Upper Troutdale Formation consists of unconsolidated to moderately consolidated silty, sandy, and clayey gravels. The Upper Troutdale Formation materials appear to be well drained except for the clayey gravel units.

The Site is mantled by Lauren-Sifton-Wind River soils resting on nearly level to gently rolling terraces typical of southwestern Clark County. The soils are gravelly and medium to coarse-grained, have a large available water capacity, and are excessively drained. The soil in the southwestern portion of the Site consists

of Wind River sandy loam, which extends over approximately 30 percent of the Site. This soil is excessively drained and exhibits moderately high permeability. In active areas on site, the upper soils are compacted and are less permeable than the loose undisturbed soils.

6.3 HYDROGEOLOGIC SETTING

Two important aquifers exist in the Portland-Vancouver area, the Pleistocene alluvial deposits and the Upper Troutdale Formation. The Pleistocene alluvial deposits are used for domestic and some irrigation supplies. The Pleistocene deposits yield up to 1,000 gallons per minute (gpm) or more from the coarser sand and gravel units; where deposits are thin and less permeable, perched or semi-perched ground-water zones may occur. Regionally, many domestic and irrigation water supply wells were completed in the Pleistocene alluvial deposits in the area between Burnt Bridge Creek and Salmon Creek (north of Burnt Bridge Creek). The Site is within the Burnt Bridge Creek/Salmon Creek Area. A perched water table is located in the eastern and central portions of the Site, underlain by fine-grained sediments and appear on a local basis ranging between 10 and 70 feet below ground surface (bgs). The groundwater flow direction in the perched water table in the eastern portion of the Site is northwest toward Cold Creek. Ecological receptors are present in Cold Creek; however, the creek is culverted through the majority of the Site and therefore, access to the Creek by ecological receptors is limited.

The Upper Troutdale Formation is used for municipal and most irrigation supplies. Wells completed in the Upper Troutdale Formation sand and gravel yield as much as 1,000 gpm (Mundorff, 1964). A deep aquifer has also been identified at or near the top of the Upper Troutdale Formation, that underlies the Site ranging between 80 and 180 feet bgs. Groundwater flow in the deep aquifer is toward the southwest. Potential receptors are located hydraulically downgradient of the Site, although the nearest municipal well is approximately one mile away.

6.4 NATURE AND EXTENT OF CONTAMINATION

The Operable Unit A Remedial Investigation included characterization of soils in 19 individual waste units and from the Ellen Davis Trail. The soil samples were analyzed for volatile organic compounds (VOCs); base neutral acid compounds (BNAs); high molecular weight polynuclear aromatic hydrocarbons (HPAHs); metals; polychlorinated biphenyls (PCB); carbamate, urea, and triazine pesticides; and chlorinated herbicides. Select soil samples collected from the Capacitor Testing Lab waste unit were analyzed for polychlorinated dioxin and furans (PCDD/PCDF). Table 2 summarizes the concentration ranges of organic contaminants detected in each waste unit, and the waste unit concentration ranges of antimony, arsenic, chromium, copper, lead, and zinc detected in surface and subsurface soils. Additional metals were detected, but their presence did not exceed risk-based criteria or background concentrations.

Table 2

Summary of Laboratory Soil Results

Operable Unit A

Concentrations expressed in mg/kg.

Depth	Analyte	Concentration Range	Frequency of Detection
Offsite Area Background			
surface	arsenic	1.2 - 6.2	4 / 6
	chromium	8 - 93.6	5 / 12
	copper	13.3 - 52.1	1 / 4
	lead	5.7 - 378	2 / 14
	zinc	36.7 - 387	4 / 12
subsurface	arsenic	1.2 - 1.9	4 / 7
	chromium	7.6 - 12.7	5 / 12
	copper	15.6 - 20.8	12 / 79
	lead	3.5 - 5.8	1 / 26
	zinc	41.9 - 55.3	3 / 43
Offsite Natural Background			
surface	arsenic	0.83 - 2.2	1 / 46
	chromium	12.7 - 54	14 / 19
	copper	10.4 - 55.7	2 / 50
	lead	6.4 - 25.1	5 / 14
	zinc	60.1 - 1420	2 / 30
Oil/Water Separators			
subsurface	1,1,1-trichloroethane	ND - 0.14	4 / 39
	1,1-dichloroethane	ND - 0.036	2 / 39
	1,1-dichloroethene	ND - 0.004	2 / 39
	2,4-d	ND - 0.013	1 / 39
	4-methyl-2-pentanone	ND - 0.11	8 / 39
	Aroclor 1248	ND - 0.097	1 / 39
	Aroclor 1254	ND - 0.27	6 / 39
	Aroclor 1260	ND - 0.088	3 / 39
	acetone	ND - 0.11	2 / 39
	ametryn	ND - 0.29	1 / 39
	arsenic	0.87 - 7.9	39 / 39
	atrazine	ND - 0.35	1 / 39
	benzo(a)anthracene	ND - 0.01	8 / 39
	benzo(a)pyrene	ND - 0.027	8 / 39
	benzo(b)fluoranthene	ND - 0.035	10 / 39
	benzo(g,h,i)perylene	ND - 0.034	7 / 39
	benzo(k)fluoranthene	ND - 0.047	6 / 39
	butylbenzylphthalate	ND - 0.07	1 / 39
	chromium	9.2 - 218	39 / 39
	chrysene	ND - 0.014	5 / 39
	copper	14.5 - 2220	39 / 39
	di-n-butylphthalate	ND - 2.2	4 / 39
	dibenzo(a,h)anthracene	ND - 0.006	3 / 39
	dicamba	ND - 0.2	1 / 39
	diethylphthalate	ND - 4	4 / 39
	dinoseb	ND - 0.0072	1 / 39
	fluoranthene	ND - 0.029	13 / 39
	indeno(1,2,3-cd)pyrene	ND - 0.022	8 / 39
	lead	2 - 7090	39 / 39
	methylene chloride	ND - 0.69	3 / 39
	pentachlorophenol	ND - 0.072	1 / 39
	prometon	ND - 0.26	2 / 39
	pyrene	ND - 0.024	11 / 39
	toluene	ND - 0.13	4 / 39
	total xylenes	ND - 0.007	1 / 39
	zinc	41.2 - 2580	39 / 39

ND - not detected

Depth	Analyte	Concentration Range	Frequency of Detection
Paint Storage Facility			
surface	arsenic	2.7	1 / 1
	benzo(a)anthracene	0.057	1 / 1
	benzo(a)pyrene	0.054	1 / 1
	benzo(b)fluoranthene	0.09	1 / 1
	benzo(g,h,i)perylene	0.096	1 / 1
	benzo(k)fluoranthene	0.056	1 / 1
	chromium	22.6	1 / 1
	chrysene	0.071	1 / 1
	copper	22.8	1 / 1
	dibenzo(a,h)anthracene	0.019	1 / 1
	fluoranthene	0.1	1 / 1
	indeno(1,2,3-cd)pyrene	0.05	1 / 1
	lead	15.9	1 / 1
	pyrene	0.11	1 / 1
	zinc	89.5	1 / 1
subsurface	arsenic	3.6	1 / 1
	chromium	25.2	1 / 1
	copper	25.5	1 / 1
	lead	7.7	1 / 1
	zinc	72.6	1 / 1
PCBs Storage Building			
surface	Aroclor 1254	ND - 0.086	4 / 8
	arsenic	ND - 5	7 / 8
	benzo(a)anthracene	ND - 12	2 / 8
	benzo(a)pyrene	ND - 11	2 / 8
	benzo(b)fluoranthene	ND - 17	4 / 8
	bis(2-ethylhexyl)phthalate	ND - 0.18	1 / 6
	butylbenzylphthalate	ND - 0.43	5 / 8
	carbazole	ND - 7.8	2 / 8
	chromium	6.9 - 22	8 / 8
	chrysene	ND - 13	3 / 8
	copper	15.3 - 48.7	8 / 8
	di-n-octylphthalate	ND - 0.036	6 / 8
	dibenzofuran	ND - 2	2 / 8
	fluoranthene	ND - 31	2 / 8
	lead	6.9 - 27.1	8 / 8
	pentachlorophenol	ND - 1.5	2 / 8
	phenanthrene	ND - 27	2 / 8
	pyrene	ND - 27	2 / 8
	zinc	44.3 - 96.2	8 / 8
subsurface	arsenic	1.5 - 3.9	6 / 6
	benzo(a)anthracene	ND - 0.022	2 / 6
	benzo(a)pyrene	ND - 0.021	1 / 6
	benzo(b)fluoranthene	ND - 0.026	2+ / 6
	benzo(g,h,i)perylene	ND - 0.017	2+ / 6
	benzo(k)fluoranthene	ND - 0.018	2+ / 6
	butylbenzylphthalate	ND - 0.041	1 / 6
	chromium	12.6 - 22.4	6 / 6
	chrysene	ND - 0.024	2+ / 6
	copper	18.2 - 26.1	6 / 6
	dibenzo(a,h)anthracene	ND - 0.004	1 / 6
	fluoranthene	ND - 0.075	2+ / 6
	fluorene	ND - 0.092	2 / 6
	indeno(1,2,3-cd)pyrene	ND - 0.018	2 / 6
	lead	2.6 - 8.7	6 / 6
	phenanthrene	ND - 0.067	1 / 6
	pyrene	ND - 0.053	2 / 6
	zinc	46.5 - 66.9	6 / 6

Table 2
Summary of Laboratory Soil Results
Operable Unit A
Concentrations expressed in mg/kg.

Depth	Analyte	Concentration Range	Frequency of Detection
Capacitor Testing Laboratory			
surface	Aroclor 1248	ND - 42	2 / 5
	Aroclor 1254	ND - 0.066	1 / 5
	Aroclor 1260	ND - 0.93	4 / 5
	arsenic	1.3 - 3.8	5 / 5
	benzo(a)anthracene	ND - 0.009	3 / 5
	benzo(a)pyrene	ND - 0.029	2 / 5
	benzo(b)fluoranthene	ND - 0.038	4 / 5
	benzo(g,h,i)perylene	ND - 0.048	4 / 5
	benzo(k)fluoranthene	ND - 0.017	4 / 5
	bis(2-ethylhexyl)phthalate	ND - 0.35	2 / 5
	chromium	12.1 - 71.3	5 / 5
	chrysene	ND - 0.034	2 / 5
	copper	18.1 - 182	5 / 5
	dibenzo(a,h)anthracene	ND - 0.006	3 / 5
	fluoranthene	ND - 0.048	4 / 5
	indeno(1,2,3-cd)pyrene	ND - 0.054	4 / 5
	lead	12.6 - 43.8	5 / 5
	pyrene	0.002 - 0.044	5 / 5
	zinc	74.8 - 711	5 / 5
	2378-TCDD	ND - 1.6 ppt	2 / 3
	123478-HxCDD	ND - 2.4 J ppt	1 / 3
	123678-HxCDD	ND - 4.9 J ppt	2 / 3
	123789-HxCDD	ND - 4.5 ppt	2 / 3
	1234678-HpCDD	3.5 - 61.7 ppt	3 / 3
	OCDD	ND - 409 ppt	2 / 3
	2378-TCDF	0.43 - 118 ppt	3 / 3
	2378-PeCDF	ND - 16 ppt	2 / 3
	23478-PeCDF	0.29 - 31.8 ppt	3 / 3
	123478-HxCDF	ND - 8.3 ppt	2 / 3
	123678-HxCDF	ND - 2.8 ppt	1 / 3
	234678-HxCDF	ND - 4.5 J ppt	2 / 3
	123789-HxCDF	ND - 1.9 ppt	2 / 3
	1234678-HpCDF	ND - 19 ppt	2 / 3
	1234789-HpCDF	ND - 24.9 ppt	1 / 3
	OCDF		
	Total TCDD	0.3 - 2.1 ppt	3 / 3
	Total PeCDD	0.49 - 23.1 J ppt	3 / 3
	Total HxCDD	1.8 - 22.4 J ppt	3 / 3
	Total HpCDD	7.9 - 98.4 ppt	3 / 3
	Total TCDF	0.96 - 450 ppt	3 / 3
	Total PeCDF	0.29 - 203 ppt	3 / 3
	Total HxCDF	2 - 66.8 ppt	3 / 3
	Total HpCDF	0.3 - 59.6 J ppt	3 / 3
subsurface	arsenic	1.9 - 5.1	6 / 6
	chromium	13.9 - 24.1	6 / 6
	copper	19.3 - 29.6	6 / 6
	lead	4.3 - 8	6 / 6
	methylene chloride	0.12 - 0.49	2 / 6
	pyrene	ND - 0.003	2 / 6
	zinc	59.7 - 71.7	6 / 6

ND - not detected

Depth	Analyte	Concentration Range	Frequency of Detection
DOB-1 Drainline			
surface	arsenic	ND - 4.8	2 / 3
	benzo(a)anthracene	0.013 - 0.2	3 / 3
	benzo(a)pyrene	0.013 - 0.18	3 / 3
	benzo(b)fluoranthene	0.01 - 0.18	3 / 3
	benzo(g,h,i)perylene	0.021 - 0.1	3 / 3
	benzo(k)fluoranthene	0.005 - 0.06	3 / 3
	bis(2-ethylhexyl)phthalate	ND - 0.4	2 / 3
	chlorpropham	ND - 0.58	1 / 3
	chromium	14.4 - 20.2	3 / 3
	chrysene	0.017 - 0.31	3 / 3
	copper	19.8 - 25.3	3 / 3
	dibenzo(a,h)anthracene	ND - 0.02	2 / 3
	fluoranthene	0.025 - 0.39	3 / 3
	fluorene	ND - 0.079	1 / 3
	indeno(1,2,3-cd)pyrene	0.005 - 0.096	3 / 3
	lead	4.3 - 14.5	3 / 3
	phenanthrene	0.027 - 0.5	3 / 3
	pyrene	0.024 - 0.47	3 / 3
	zinc	60.9 - 74.7	3 / 3
subsurface	Aroclor 1254	ND - 13	2 / 21
	arsenic	ND - 2.8	16 / 21
	benzo(a)anthracene	ND - 4.7	1 / 21
	benzo(a)pyrene	ND - 3.5	1 / 21
	benzo(b)fluoranthene	ND - 2.1	1 / 21
	benzo(g,h,i)perylene	ND - 1.7	1 / 21
	benzo(k)fluoranthene	ND - 1.1	1 / 21
	bis(2-ethylhexyl)phthalate	ND - 0.13	2 / 21
	chromium	7.1 - 52.7	21 / 21
	chrysene	ND - 5.3	1 / 21
	copper	11.7 - 25.4	21 / 21
	di-n-butylphthalate	ND - 0.055	1 / 21
	dibenzo(a,h)anthracene	ND - 0.63	1 / 21
	fluoranthene	ND - 11	5 / 21
	fluorene	ND - 2.1	1 / 21
	indeno(1,2,3-cd)pyrene	ND - 2	1 / 21
	lead	1.6 - 252	21 / 21
	phenanthrene	ND - 0.084	1 / 21
	pyrene	ND - 11	1 / 21
	zinc	31 - 67.3	21 / 21

Table 2

Summary of Laboratory Soil Results

Operable Unit A

Concentrations expressed in mg/kg.

Depth	Analyte	Concentration Range	Frequency of Detection
DOB-2 Sanitary Drainfield			
subsurface	4-methyl-2-pentanone	ND - 0.007	3 / 13
	arsenic	ND - 1.9	11 / 13
	benzo(a)anthracene	ND - 0.037	1 / 13
	benzo(a)pyrene	ND - 0.026	1 / 13
	benzo(b)fluoranthene	ND - 0.027	2 / 13
	benzo(g,h,i)perylene	ND - 0.018	1 / 13
	benzo(k)fluoranthene	ND - 0.021	1 / 13
	bis(2-ethylhexyl)phthalate	ND - 0.38	1 / 13
	chromium	4.5 - 18.8	13 / 13
	chrysene	ND - 0.021	1 / 13
	copper	13.3 - 26.6	13 / 13
	dibenzo(a,h)anthracene	ND - 0.006	1 / 13
	fluoranthene	ND - 0.07	3 / 13
	fluorene	ND - 0.012	1 / 13
	indeno(1,2,3-cd)pyrene	ND - 0.015	1 / 13
	lead	3.1 - 6.7	13 / 13
	phenanthrene	ND - 0.053	1 / 13
	pyrene	ND - 0.075	2 / 13
	zinc	35.8 - 62.4	13 / 13
Ellen Davis Trail			
surface	arsenic	1.9 - 17.3	3 / 3
	benzo(a)anthracene	0.004 - 0.01	3 / 3
	benzo(a)pyrene	0.01 - 0.021	3 / 3
	benzo(b)fluoranthene	0.01 - 0.022	3 / 3
	benzo(g,h,i)perylene	0.007 - 0.026	3 / 3
	benzo(k)fluoranthene	0.005 - 0.039	3 / 3
	chromium	12.6 - 17	3 / 3
	chrysene	0.009 - 0.031	3 / 3
	copper	14.5 - 19.7	3 / 3
	dibenzo(a,h)anthracene	ND - 0.003	1 / 3
	fluoranthene	0.015 - 0.033	3 / 3
	indeno(1,2,3-cd)pyrene	0.005 - 0.021	3 / 3
	lead	8.6 - 37.4	3 / 3
	pyrene	0.002 - 0.034	3 / 3
	toluene	ND - 0.016	2 / 3
	total xylenes	ND - 0.008	1 / 3
	zinc	69.7 - 78.2	3 / 3
subsurface	arsenic	1.3 - 2.5	2 / 2
	chromium	11.3 - 22.1	2 / 2
	copper	21.7 - 26.9	2 / 2
	lead	3.3 - 8.2	2 / 2
	pyrene	0.002 - 0.004	2 / 2
	zinc	46.2 - 55.1	2 / 2

ND - not detected

Depth	Analyte	Concentration Range	Frequency of Detection
Hazardous Waste Storage Building			
surface	2-methylnaphthalene	0.36	1 / 1
	Aroclor 1254	0.046	1 / 1
	acenaphthene	2.9	1 / 1
	acenaphthylene	0.093	1 / 1
	anthracene	3.1	1 / 1
	arsenic	1.2	1 / 1
	benzo(a)anthracene	4.1	1 / 1
	benzo(a)pyrene	3.4	1 / 1
	benzo(b)fluoranthene	4.1	1 / 1
	benzo(g,h,i)perylene	2.6	1 / 1
	benzo(k)fluoranthene	1.2	1 / 1
	carbazole	3.8	1 / 1
	chromium	8.2	1 / 1
	chrysene	3.7	1 / 1
	copper	22.1	1 / 1
	dibenzo(a,h)anthracene	0.64	1 / 1
	dibenzofuran	1.7	1 / 1
	dimethylphthalate	0.32	1 / 1
	fluoranthene	13	1 / 1
	fluorene	2.3	1 / 1
	indeno(1,2,3-cd)pyrene	2.6	1 / 1
	lead	15.1	1 / 1
subsurface	methylene chloride	1.3	1 / 1
	naphthalene	0.55	1 / 1
	pentachlorophenol	0.1	1 / 1
	phenanthrene	16	1 / 1
	pyrene	8.6	1 / 1
	zinc	95.4	1 / 1
	arsenic	1.8 - 2.4	2 / 2
	chromium	11.8 - 15.2	2 / 2
	copper	20.1 - 23.8	2 / 2
	fluoranthene	ND - 0.008	1 / 2
	lead	6.2 - 10.4	2 / 2
	methylene chloride	ND - 0.43	1 / 2
	zinc	65 - 72	2 / 2

Table 2
Summary of Laboratory Soil Results
Operable Unit A
Concentrations expressed in mg/kg.

Depth	Analyte	Concentration Range	Frequency of Detection
Herbicide Storage Area			
surface	acetone	ND - 0.028	1 / 2
	anthracene	ND - 0.038	1 / 2
	arsenic	0.52 - 1.1	2 / 2
	benzo(a)anthracene	0.02 - 0.19	2 / 2
	benzo(a)pyrene	0.004 - 0.23	2 / 2
	benzo(b)fluoranthene	ND - 0.44	1 / 2
	benzo(g,h,i)perylene	ND - 0.19	1 / 2
	benzo(k)fluoranthene	ND - 0.029	1 / 2
	bis(2-ethylhexyl)phthalate	ND - 0.92	1 / 2
	chromium	3.2 - 7.3	2 / 2
	chrysene	0.041 - 0.31	2 / 2
	copper	19.2 - 20.9	2 / 2
	dibenzo(a,h)anthracene	0.0073 - 0.054	2 / 2
	fluoranthene	0.031 - 0.59	2 / 2
	fluorene	ND - 0.005	1 / 2
	indeno(1,2,3-cd)pyrene	0.005 - 0.18	2 / 2
	lead	4.6 - 8.2	2 / 2
	phenanthrene	ND - 0.44	1 / 2
	pyrene	0.027 - 0.52	2 / 2
	toluene	ND - 0.037	1 / 2
	total xylenes	ND - 0.013	1 / 2
	zinc	29.9 - 66.4	2 / 2
subsurface	acetone	ND - 0.033	5 / 6
	arsenic	1 - 2	6 / 6
	chromium	8.1 - 12.4	6 / 6
	copper	13.7 - 18.3	6 / 6
	fluoranthene	ND - 0.005	1 / 6
	lead	3.2 - 8.7	6 / 6
	zinc	36.8 - 63.1	6 / 6
Top Coat Test Area			
surface	arsenic	1.1 - 2.6	2 / 2
	benzo(a)anthracene	ND - 0.032	2 / 2
	benzo(a)pyrene	ND - 0.018	2 / 2
	benzo(b)fluoranthene	ND - 0.055	2 / 2
	benzo(g,h,i)perylene	ND - 0.035	1 / 2
	benzo(k)fluoranthene	ND - 0.007	2 / 2
	chromium	11.1 - 210	2 / 2
	chrysene	ND - 0.086	1 / 2
	copper	21 - 31.6	2 / 2
	dibenzo(a,h)anthracene	ND - 0.006	1 / 2
	fluoranthene	ND - 0.064	2 / 2
	lead	5 - 9.4	2 / 2
	phenanthrene	ND - 0.13	1 / 2
	pyrene	ND - 0.061	2 / 2
	zinc	63.8 - 70.1	2 / 2
subsurface	arsenic	1.1 - 2.1	7 / 7
	benzo(a)anthracene	ND - 0.019	2 / 7
	benzo(a)pyrene	ND - 0.028	2 / 7
	benzo(b)fluoranthene	ND - 0.027	2 / 7
	benzo(g,h,i)perylene	ND - 0.025	2 / 7
	benzo(k)fluoranthene	ND - 0.009	1 / 7
	chromium	9.4 - 22.3	7 / 7
	chrysene	ND - 0.02	2 / 7
	copper	16.5 - 23	7 / 7
	di-n-butylphthalate	ND - 0.28	2 / 7
	dibenzo(a,h)anthracene	ND - 0.004	2 / 7
	fluoranthene	ND - 0.042	2 / 7
	indeno(1,2,3-cd)pyrene	ND - 0.023	2 / 7
	lead	3.9 - 5.9	7 / 7
	methylene chloride	ND - 0.19	1 / 7
	pyrene	ND - 0.033	2 / 7
	zinc	45.4 - 75.2	7 / 7

Depth	Analyte	Concentration Range	Frequency of Detection
Laboratory Waste Storage Area			
surface	2-butanone	ND - 0.007	1 / 4
	Aroclor 1254	ND - 0.45	2 / 4
	anthracene	ND - 0.14	1 / 4
	arsenic	0.85 - 1.5	4 / 4
	benzo(a)anthracene	ND - 0.55	2 / 4
	benzo(a)pyrene	ND - 0.57	2 / 4
	benzo(b)fluoranthene	ND - 0.86	1 / 4
	benzo(g,h,i)perylene	ND - 0.34	2 / 4
	benzo(k)fluoranthene	ND - 0.24	1 / 4
	chlorpropham	1	1 / 1
	chromium	4.1 - 10.3	4 / 4
	chrysene	ND - 0.67	2 / 4
	copper	18 - 41.5	4 / 4
	dibenzo(a,h)anthracene	ND - 0.017	1 / 4
	fluoranthene	ND - 1.8	2 / 4
	fluorene	ND - 0.35	1 / 4
	indeno(1,2,3-cd)pyrene	ND - 0.44	2 / 4
	lead	4.6 - 33	4 / 4
	methylene chloride	ND - 0.54	1 / 4
	n-nitroso-di-n-propylamine	ND - 0.31	1 / 4
	pyrene	ND - 1.3	3 / 4
	toluene	ND - 0.041	1 / 4
	total xylenes	ND - 0.034	2 / 4
	zinc	29.9 - 66.9	4 / 4
subsurface	arsenic	1.2 - 2.2	6 / 6
	benzo(a)anthracene	ND - 0.003	1 / 6
	benzo(a)pyrene	ND - 0.003	1 / 6
	benzo(b)fluoranthene	ND - 0.002	1 / 6
	benzo(g,h,i)perylene	ND - 0.006	1 / 6
	benzo(k)fluoranthene	ND - 0.002	1 / 6
	chromium	5.6 - 10.8	6 / 6
	chrysene	ND - 0.002	1 / 6
	copper	12.5 - 26.2	6 / 6
	dibenzo(a,h)anthracene	ND - 0.005	1 / 6
	fluoranthene	ND - 0.018	3 / 6
	lead	3.6 - 7.9	6 / 6
	pyrene	ND - 0.017	1 / 6
	zinc	32.8 - 57.9	6 / 6

ND - not detected

Table 2
Summary of Laboratory Soil Results
Operable Unit A
Concentrations expressed in mg/kg.

Depth	Analyte	Concentration Range	Frequency of Detection
Plumbing Shop			
surface	arsenic	4.8	1 / 1
	benzo(a)anthracene	0.009	1 / 1
	benzo(a)pyrene	0.004	1 / 1
	benzo(b)fluoranthene	0.005	1 / 1
	benzo(g,h,i)perylene	0.002	1 / 1
	benzo(k)fluoranthene	0.004	1 / 1
	butylbenzylphthalate	0.042	1 / 1
	chromium	8.3	1 / 1
	chrysene	0.008	1 / 1
	copper	44.4	1 / 1
	fluoranthene	0.025	1 / 1
	fluorene	0.004	1 / 1
	indeno(1,2,3-cd)pyrene	0.008	1 / 1
	lead	199	1 / 1
	phenanthrene	0.2	1 / 1
	pyrene	0.006	1 / 1
	zinc	51.2	1 / 1
subsurface	2-hexanone	ND - 0.056	1 / 11
	4-methyl-2-pentanone	ND - 690	5 / 11
	arsenic	1.5 - 5.4	11 / 11
	baygon	ND - 2.5	1 / 11
	benzo(a)anthracene	ND - 1.3	5 / 11
	benzo(a)pyrene	ND - 1.4	5 / 11
	benzo(b)fluoranthene	ND - 1.2	5 / 11
	benzo(g,h,i)perylene	ND - 0.76	5 / 11
	benzo(k)fluoranthene	ND - 0.7	5 / 11
	bis(2-ethylhexyl)phthalate	ND - 2.9	2 / 11
	butylbenzylphthalate	ND - 0.038	1 / 11
	chlorpropham	ND - 0.25	1 / 11
	chromium	6.5 - 22.5	11 / 11
	chrysene	ND - 1.2	5 / 11
	copper	6.2 - 45.9	11 / 11
	di-n-butylphthalate	ND - 1.1	2 / 11
	dibenzo(a,h)anthracene	ND - 0.14	5 / 11
	fluoranthene	ND - 3.4	5 / 11
	fluorene	ND - 0.12	4 / 11
	indeno(1,2,3-cd)pyrene	ND - 0.76	5 / 11
	lead	3.1 - 11.6	11 / 11
	methylene chloride	ND - 0.41	1 / 11
	phenanthrene	ND - 0.2	3 / 11
	propham	ND - 0.27	1 / 11
	pyrene	ND - 2.4	5 / 11
	toluene	ND - 1800	2 / 11
	total xylenes	ND - 250	1 / 11
	zinc	40.5 - 84.4	11 / 11

ND - not detected

Depth	Analyte	Concentration Range	Frequency of Detection
Ross Substation and Capacitor Yard			
surface	2-butanone	ND - 0.033	3 / 32
	a-1242	ND - 94	2 / 34
	Aroclor 1248	ND - 130	5 / 34
	Aroclor 1254	ND - 16	2 / 34
	Aroclor 1260	ND - 2	6 / 34
	acetone	ND - 0.37	1 / 32
	anthracene	ND - 0.061	1 / 32
	antimony	ND - 45.3	1 / 32
	arsenic	0.65 - 4.9	32 / 32
	atrazine	ND - 0.006	1 / 29
	benzo(a)anthracene	ND - 0.72	13 / 32
	benzo(a)pyrene	ND - 0.75	16 / 32
	benzo(b)fluoranthene	ND - 0.59	14 / 32
	benzo(g,h,i)perylene	ND - 0.61	12 / 32
	benzo(k)fluoranthene	ND - 0.32	13 / 32
	butylbenzylphthalate	ND - 0.023	2 / 32
	chromium	6.7 - 49.9	32 / 32
	chrysene	ND - 0.52	15 / 32
	copper	18.4 - 46.7	32 / 32
	di-n-butylphthalate	ND - 0.13	1 / 32
	di-n-octylphthalate	ND - 0.045	2 / 32
	dibenzo(a,h)anthracene	ND - 0.13	7 / 32
	fluoranthene	ND - 0.93	13 / 32
	fluorene	ND - 0.026	5 / 32
	indeno(1,2,3-cd)pyrene	ND - 0.57	13 / 32
	lead	7.1 - 2360	32 / 32
	phenanthrene	ND - 0.26	4 / 32
	prometon	ND - 0.67	7 / 29
	pyrene	ND - 1.1	23 / 32
	toluene	ND - 0.013	6 / 32
	zinc	44 - 604	32 / 32
subsurface	4-methyl-2-pentanone	ND - 0.006	2 / 15
	arsenic	ND - 4.1	16 / 17
	benzo(a)anthracene	ND - 0.021	1 / 15
	benzo(a)pyrene	ND - 0.02	1 / 15
	benzo(b)fluoranthene	ND - 0.02	1 / 15
	benzo(g,h,i)perylene	ND - 0.014	2 / 15
	benzo(k)fluoranthene	ND - 0.006	2 / 15
	bis(2-ethylhexyl)phthalate	ND - 0.024	1 / 15
	chromium	8.6 - 17	17 / 17
	chrysene	ND - 0.02	1 / 15
	copper	17.4 - 27	17 / 17
	di-n-butylphthalate	ND - 3	3 / 15
	dibenzo(a,h)anthracene	ND - 0.003	1 / 15
	fluoranthene	ND - 0.062	1 / 15
	fluorene	ND - 0.015	1 / 15
	indeno(1,2,3-cd)pyrene	ND - 0.013	1 / 15
	lead	3.9 - 270	17 / 17
	methylene chloride	ND - 0.4	3 / 15
	pyrene	ND - 0.045	2 / 15
	zinc	41 - 77.7	17 / 17

Table 2
Summary of Laboratory Soil Results
Operable Unit A
Concentrations expressed in mg/kg.

Depth	Analyte	Concentration Range	Frequency of Detection
Sandblasting Area			
surface	Aroclor 1248	ND - 0.052	1 / 5
	Aroclor 1254	ND - 0.078	1 / 5
	Aroclor 1260	ND - 0.11	3 / 5
	antimony	ND - 182	7 / 24
	arsenic	2.1 - 23.5	24 / 24
	benzo(a)anthracene	ND - 0.44	4 / 5
	benzo(a)pyrene	ND - 0.043	3 / 5
	benzo(b)fluoranthene	ND - 0.19	4 / 5
	benzo(g,h,i)perylene	ND - 0.89	5 / 5
	benzo(k)fluoranthene	ND - 0.066	3 / 5
	bis(2-ethylhexyl)phthalate	ND - 11	4 / 5
	chromium	8.5 - 170	24 / 24
	chrysene	ND - 0.22	4 / 5
	copper	20.2 - 141	24 / 24
	dibenzo(a,h)anthracene	ND - 0.003	3 / 5
	fluoranthene	ND - 0.56	4 / 5
	fluorene	ND - 0.005	2 / 5
	indeno(1,2,3-cd)pyrene	ND - 0.043	5 / 5
	isophorone	ND - 0.11	1 / 5
	lead	3 - 651	24 / 24
	phenanthrene	ND - 0.12	1 / 5
	pyrene	ND - 0.44	5 / 5
	zinc	40.3 - 3330	24 / 24
subsurface	arsenic	0.66 - 6	19 / 19
	chromium	9 - 30.4	19 / 19
	copper	17.4 - 37.8	19 / 19
	lead	4.4 - 2250	19 / 19
	zinc	61.7 - 101	19 / 19
Temporary Storage Area			
subsurface	arsenic	ND - 2	7 / 8
	benzo(a)anthracene	ND - 0.048	1 / 8
	benzo(a)pyrene	ND - 0.013	1 / 8
	benzo(b)fluoranthene	ND - 0.12	2 / 8
	benzo(g,h,i)perylene	ND - 0.085	3 / 8
	benzo(k)fluoranthene	ND - 0.015	1 / 8
	bis(2-ethylhexyl)phthalate	ND - 0.34	3 / 8
	chromium	7.1 - 9.7	8 / 8
	chrysene	ND - 0.092	2 / 8
	copper	15.3 - 18	8 / 8
	dibenzo(a,h)anthracene	ND - 0.003	1 / 8
	fluoranthene	ND - 0.073	1 / 8
	indeno(1,2,3-cd)pyrene	ND - 0.069	2 / 8
	lead	1.4 - 10.5	8 / 8
	pentachlorophenol	ND - 0.088	1 / 8
	pyrene	ND - 0.077	3 / 8
	zinc	34.4 - 57.7	8 / 8

Depth	Analyte	Concentration Range	Frequency of Detection	
Wood Pole Storage Area South				
surface	Aroclor 1254	ND - 5.3	2 / 7	
	arsenic	1.1 - 1.9	7 / 7	
	benzo(a)anthracene	ND - 0.1	5 / 7	
	benzo(a)pyrene	ND - 0.055	5 / 7	
	benzo(b)fluoranthene	ND - 0.19	4 / 7	
	benzo(g,h,i)perylene	ND - 0.038	5 / 7	
	benzo(k)fluoranthene	ND - 0.067	6 / 7	
	chromium	12.7 - 20.5	7 / 7	
	chrysene	ND - 0.25	6 / 7	
	copper	14.3 - 26.8	7 / 7	
	dibenzo(a,h)anthracene	ND - 0.006	3 / 7	
	dimethylphthalate	ND - 0.22	1 / 7	
	fluoranthene	ND - 0.6	5 / 7	
	indeno(1,2,3-cd)pyrene	ND - 0.045	5 / 7	
	lead	6.6 - 640	7 / 7	
	methylene chloride	ND - 0.67	3 / 7	
	pentachlorophenol	ND - 0.78	3 / 7	
	phenanthrene	ND - 0.2	1 / 7	
	pyrene	ND - 0.53	6 / 7	
	toluene	ND - 0.025	3 / 7	
	zinc	66.3 - 184	7 / 7	
	subsurface	4-methyl-2-pentanone	ND - 0.007	1 / 25
		Aroclor 1254	ND - 0.086	1 / 25
arsenic		0.76 - 1.8	25 / 25	
benzo(a)anthracene		ND - 0.063	2 / 25	
benzo(a)pyrene		ND - 0.067	2 / 25	
benzo(b)fluoranthene		ND - 0.15	4 / 25	
benzo(g,h,i)perylene		ND - 0.078	1 / 25	
benzo(k)fluoranthene		ND - 0.004	1 / 25	
chromium		7.7 - 18.4	25 / 25	
chrysene		ND - 0.1	3 / 25	
copper		15.2 - 30	25 / 25	
dibenzo(a,h)anthracene		ND - 0.002	1 / 25	
dimethylphthalate		ND - 0.23	1 / 25	
fluoranthene		ND - 0.14	2 / 25	
indeno(1,2,3-cd)pyrene		ND - 0.053	1 / 25	
lead		3.5 - 11.3	25 / 25	
n-nitrosodiphenylamine		ND - 0.045	1 / 25	
pentachlorophenol	ND - 1	1 / 25		
pyrene	ND - 0.16	4 / 25		
toluene	ND - 0.016	4 / 25		
zinc	46.1 - 70.9	25 / 25		

ND - not detected

Table 2
Summary of Laboratory Soil Results
Operable Unit A
Concentrations expressed in mg/kg.

Depth	Analyte	Concentration Range	Frequency of Detection
Untanking Tower			
surface	1,1,1-trichloroethane	ND - 0.35	1 / 2
	1,1-dichloroethene	ND - 0.016	1 / 2
	Aroclor 1254	ND - 5.9	1 / 2
	Aroclor 1260	ND - 0.069	1 / 2
	arsenic	1.6 - 2.1	2 / 2
	benzene	ND - 0.012	1 / 2
	benzo(a)anthracene	ND - 0.037	1 / 2
	benzo(a)pyrene	ND - 0.0027	1 / 2
	benzo(b)fluoranthene	ND - 0.093	1 / 2
	benzo(g,h,i)perylene	0.088 - 0.23	2 / 2
	benzo(k)fluoranthene	ND - 0.011	1 / 2
	butylbenzylphthalate	ND - 0.24	1 / 2
	chromium	13.8 - 21	2 / 2
	chrysene	0.098 - 0.38	2 / 2
	copper	24.4 - 311	2 / 2
	fluoranthene	0.091 - 0.22	2 / 2
	indeno(1,2,3-cd)pyrene	ND - 0.019	1 / 2
	lead	15.6 - 69.1	2 / 2
	phenanthrene	ND - 0.24	1 / 2
	pyrene	0.04 - 0.24	2 / 2
	toluene	ND - 0.084	1 / 2
	total xylenes	ND - 0.024	1 / 2
	zinc	84.2 - 240	2 / 2
subsurface	1,1,1-trichloroethane	ND - 0.007	1 / 9
	Aroclor 1248	ND - 0.074	1 / 9
	Aroclor 1254	ND - 0.095	1 / 9
	arsenic	1.1 - 1.8	9 / 9
	benzo(a)anthracene	ND - 0.067	2 / 9
	benzo(a)pyrene	ND - 0.028	2 / 9
	benzo(b)fluoranthene	ND - 0.08	1 / 9
	benzo(g,h,i)perylene	ND - 0.042	1 / 9
	benzo(k)fluoranthene	ND - 0.029	1 / 9
	butylbenzylphthalate	ND - 0.15	8 / 9
	chromium	7 - 13.8	9 / 9
	chrysene	ND - 0.077	1 / 9
	copper	14.7 - 20.5	9 / 9
	dibenzo(a,h)anthracene	ND - 0.005	1 / 9
	fluoranthene	ND - 0.13	4 / 9
	indeno(1,2,3-cd)pyrene	ND - 0.039	1 / 9
	lead	2.7 - 7.1	9 / 9
	phenanthrene	ND - 0.13	1 / 9
	pyrene	ND - 0.15	2 / 9
	zinc	31.4 - 60.2	9 / 9

ND - not detected

Depth	Analyte	Concentration Range	Frequency of Detection
Utilization and Disposal Yard			
surface	2-methylnaphthalene	ND - 0.11	1 / 9
	4-methyl-2-pentanone	ND - 0.008	2 / 9
	α-1242	ND - 0.54	1 / 9
	acenaphthene	ND - 0.85	3 / 9
	anthracene	ND - 1.4	3 / 9
	arsenic	ND - 4.7	8 / 9
	benzo(a)anthracene	ND - 3.1	7 / 9
	benzo(a)pyrene	ND - 3.1	5 / 9
	benzo(b)fluoranthene	ND - 3	6 / 9
	benzo(g,h,i)perylene	ND - 2	7 / 9
	benzo(k)fluoranthene	ND - 2.3	6 / 9
	butylbenzylphthalate	ND - 0.077	1 / 9
	carbazole	ND - 1.3	2 / 9
	chromium	5.8 - 24.7	9 / 9
	chrysene	ND - 3.2	7 / 9
	copper	17.7 - 49.9	9 / 9
	dibenzo(a,h)anthracene	ND - 0.4	40 / 9
	dibenzofuran	ND - 0.59	2 / 9
	diethylphthalate	ND - 0.036	1 / 9
	fluoranthene	ND - 6	6 / 9
	fluorene	ND - 2.2	5 / 9
	indeno(1,2,3-cd)pyrene	ND - 1.8	6 / 9
	lead	2.4 - 11.2	9 / 9
	methylene chloride	ND - 0.18	1 / 9
	naphthalene	ND - 0.46	2 / 9
	phenanthrene	ND - 6.9	4 / 9
	pyrene	ND - 8.3	7 / 9
	toluene	ND - 0.046	2 / 9
	total xylenes	ND - 0.014	1 / 9
	zinc	28.8 - 76.7	9 / 9
subsurface	4-methyl-2-pentanone	ND - 0.04	3 / 18
	acenaphthene	ND - 0.028	1 / 18
	acetone	ND - 0.022	1 / 18
	anthracene	ND - 0.031	1 / 18
	arsenic	1.1 - 6.6	18 / 18
	benzo(a)anthracene	ND - 0.2	6 / 18
	benzo(a)pyrene	ND - 0.2	6 / 18
	benzo(b)fluoranthene	ND - 0.19	6 / 18
	benzo(g,h,i)perylene	ND - 0.12	4 / 18
	benzo(k)fluoranthene	ND - 0.093	5 / 18
	bis(2-ethylhexyl)phthalate	ND - 0.36	4 / 18
	carbazole	ND - 0.14	2 / 18
	chromium	12.6 - 22.6	18 / 18
	chrysene	ND - 0.19	5 / 18
	copper	12.7 - 27.4	18 / 18
	di-n-butylphthalate	ND - 0.27	1 / 18
	dibenzo(a,h)anthracene	ND - 0.024	3 / 18
	fluoranthene	ND - 0.64	6 / 18
	fluorene	ND - 0.14	7 / 18
	indeno(1,2,3-cd)pyrene	ND - 0.13	4 / 18
	lead	4.4 - 16.2	18 / 18
	methylene chloride	ND - 0.3	2 / 18
	phenanthrene	ND - 0.68	3 / 18
	pyrene	ND - 0.45	10 / 18
	toluene	ND - 0.012	3 / 18
	zinc	48 - 81.9	18 / 18

Table 2

Summary of Laboratory Soil Results

Operable Unit A

Concentrations expressed in mg/kg.

Depth	Analyte	Concentration Range	Frequency of Detection
Vans Way Storage Area			
surface	anthracene	ND - 1.9	1 / 6
	arsenic	ND - 5	4 / 6
	benzo(a)anthracene	ND - 0.008	3 / 6
	benzo(a)pyrene	ND - 0.46	5 / 6
	benzo(b)fluoranthene	ND - 0.35	4 / 6
	benzo(g,h,i)perylene	ND - 0.94	4 / 6
	benzo(k)fluoranthene	ND - 0.007	3 / 6
	bis(2-ethylhexyl)phthalate	ND - 1.1	2 / 6
	chromium	8.2 - 18.5	6 / 6
	chrysene	ND - 0.45	3 / 6
	copper	23.5 - 27.8	6 / 6
	dibenzo(a,h)anthracene	ND - 0.21	3 / 6
	diethylphthalate	ND - 2.6	2 / 6
	fluoranthene	ND - 2.8	6 / 6
	indeno(1,2,3-cd)pyrene	ND - 0.053	4 / 6
	lead	5.3 - 55.2	6 / 6
	methylene chloride	ND - 0.041	3 / 6
	n-nitrosodiphenylamine	ND - 0.05	1 / 6
	phenanthrene	ND - 2.1	2 / 6
	pyrene	ND - 2	6 / 6
	toluene	ND - 0.064	3 / 6
	total xylenes	ND - 0.006	1 / 6
	zinc	54.4 - 182	6 / 6
subsurface	2-butanone	ND - 0.008	1 / 21
	2-hexanone	ND - 0.007	1 / 21
	4-methyl-2-pentanone	ND - 0.036	17 / 21
	antimony	ND - 22.2	1 / 21
	arsenic	ND - 5.5	7 / 21
	benzo(a)pyrene	ND - 0.002	1 / 21
	benzo(b)fluoranthene	ND - 0.002	2 / 21
	bis(2-ethylhexyl)phthalate	ND - 3.3	1 / 21
	butylbenzylphthalate	ND - 0.72	4 / 21
	chromium	10.9 - 28	21 / 21
	chrysene	ND - 0.003	1 / 21
	copper	18.1 - 33.2	21 / 21
	dibenzo(a,h)anthracene	ND - 0.002	2 / 21
	diethylphthalate	ND - 0.13	1 / 21
	lead	3.8 - 18.6	21 / 21
	n-nitrosodiphenylamine	ND - 0.048	2 / 21
	pyrene	ND - 0.003	1 / 21
	toluene	ND - 0.038	4 / 21
	total xylenes	ND - 0.027	1 / 21
	zinc	53.9 - 127	21 / 21

ND - not detected

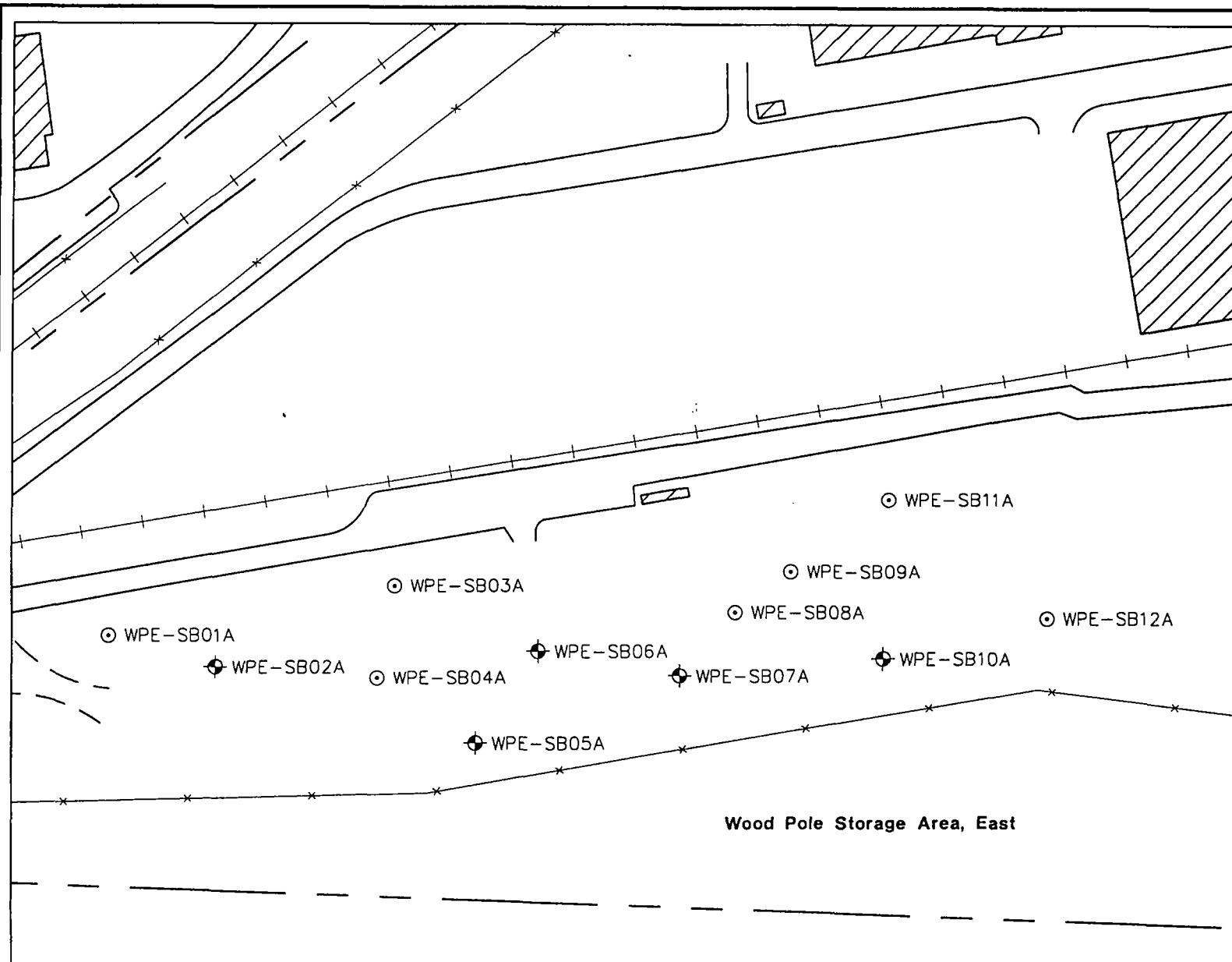
Depth	Analyte	Concentration Range	Frequency of Detection
Wood Pole Storage Area East			
surface	acenaphthene	ND - 0.16	1 / 7
	acenaphthylene	ND - 2.6	5 / 7
	acetone	ND - 0.008	1 / 7
	anthracene	ND - 6.3	6 / 7
	arsenic	0.92 - 13.2	7 / 7
	benzo(a)anthracene	ND - 30	6 / 7
	benzo(a)pyrene	ND - 24	6 / 7
	benzo(b)fluoranthene	0.15 - 28	7 / 7
	benzo(g,h,i)perylene	0.17 - 6	7 / 7
	benzo(k)fluoranthene	0.021 - 13	7 / 7
	bis(2-ethylhexyl)phthalate	ND - 0.092	1 / 7
	carbazole	ND - 8.6	5 / 7
	chromium	5.7 - 12.9	7 / 7
	chrysene	ND - 45	6 / 7
	copper	23.4 - 82.6	7 / 7
	dibenzo(a,h)anthracene	ND - 0.13	6 / 7
	dibenzofuran	ND - 0.25	2 / 7
	fluoranthene	0.074 - 350	7 / 7
	fluorene	ND - 0.67	6 / 7
	indeno(1,2,3-cd)pyrene	ND - 4.4	5 / 7
	lead	4.8 - 15.8	7 / 7
	methylene chloride	ND - 0.27	2 / 7
	naphthalene	ND - 0.088	1 / 7
	pentachlorophenol	ND - 62	6 / 7
	phenanthrene	ND - 21	6 / 7
	pyrene	0.066 - 120	7 / 7
	zinc	42.9 - 71.2	7 / 7
subsurface	2-butanone	ND - 0.014	1 / 23
	4-methyl-2-pentanone	ND - 0.012	10 / 23
	arsenic	1 - 7.4	23 / 23
	benzo(a)anthracene	ND - 0.43	1 / 23
	benzo(a)pyrene	ND - 0.45	1 / 23
	benzo(b)fluoranthene	ND - 0.36	2 / 23
	benzo(g,h,i)perylene	ND - 0.25	1 / 23
	benzo(k)fluoranthene	ND - 0.19	2 / 23
	bis(2-ethylhexyl)phthalate	ND - 3.2	9 / 23
	chromium	8.8 - 32.2	23 / 23
	chrysene	ND - 0.37	1 / 23
	copper	16 - 28.9	23 / 23
	di-n-butylphthalate	ND - 0.39	3 / 23
	dibenzo(a,h)anthracene	ND - 0.043	2 / 23
	diethylphthalate	ND - 0.064	1 / 23
	fluoranthene	ND - 1.4	8 / 23
	fluorene	ND - 0.31	1 / 23
	indeno(1,2,3-cd)pyrene	ND - 0.25	1 / 23
	lead	3.5 - 13.3	23 / 23
	methylene chloride	ND - 0.1	1 / 23
	pyrene	ND - 1	3 / 23
	zinc	43.9 - 79.4	23 / 23

Although a broad list of compounds were found in soils the areas investigated in OUA, a subset of these compounds were identified as "compounds of concern" based on their frequency of detection, concentrations relative to background levels, and concentrations relative to risk-based and regulatory criteria. The compounds of concern evaluated in the risk assessment include:

- metals: antimony, arsenic, chromium, copper, lead, and zinc;
- HPAHs: total HPAHs and individual HPAHs including benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene; (benzo(a)pyrene was individually evaluated;
- pentachlorophenol;
- bis(2-ethylhexyl)phthalate;
- PCBs, and;
- dioxins (2,3,7,8-TCDD; only for the Capacitor Testing Lab).

Compounds of concern were not found or found in low concentrations in ten of the waste units. In these areas, no action was required by the State or EPA. Compounds of concern that exceeded MTCA cleanup standards were found in seven waste units. These were addressed by removal actions.

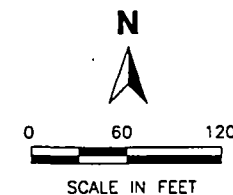
Various compounds of concern were found in laterally extensive areas in the three actionable waste units: Wood Pole Storage Area East, Ross Substation and Capacitor Yard, and Capacitor Testing Lab. The contaminants of concern identified in the Wood Pole Storage Area East are HPAHs and pentachlorophenol. HPAHs and pentachlorophenol are considered to be carcinogenic. HPAHs are relatively insoluble in water, have a high affinity for soils and therefore, are relatively immobile. Pentachlorophenol is relatively soluble in water, tends to sorb to particulate matter and is readily biodegradable. Mobility of pentachlorophenol is expected to be limited due to the presence of compacted soils containing low permeability rates in this area. Contaminated soil in the OUA are not RCRA wastes since the material would not designate as a dangerous waste based on WAC-173-303-070(3). It is also not a federal hazardous waste as defined in 40 CFR Part 261 because it is neither a listed waste nor is it characteristic. HPAHs were detected in soils throughout this waste unit from 0 to 3 feet bgs, and pentachlorophenol was detected only in surface soils throughout the area. Trace levels of HPAH (<0.003 mg/kg) were detected at 7.5 feet bgs at select locations. Figures 3 and 4 show the concentration and distribution of pentachlorophenol and HPAH in this area, respectively. Figure 5 shows the estimated area of contaminated soil and the estimated volume of contaminated material is 3,655 yd³. HPAHs and pentachlorophenol found in soils in this area were from chemicals that dripped from the treated transmission poles stored in this area.



Concentrations of Pentachlorophenol in the Wood Pole Storage Area East

STATION	DEPTH	CONC.	QUAL
WPE-SB02A	0	62	
WPE-SB05A	0	34	J
WPE-SB06A	0	17	J
WPE-SB07A	0	12	J
WPE-SB10A	0	9.8	J

Values reported in ppm.
J - The associated value is an estimated quantity.



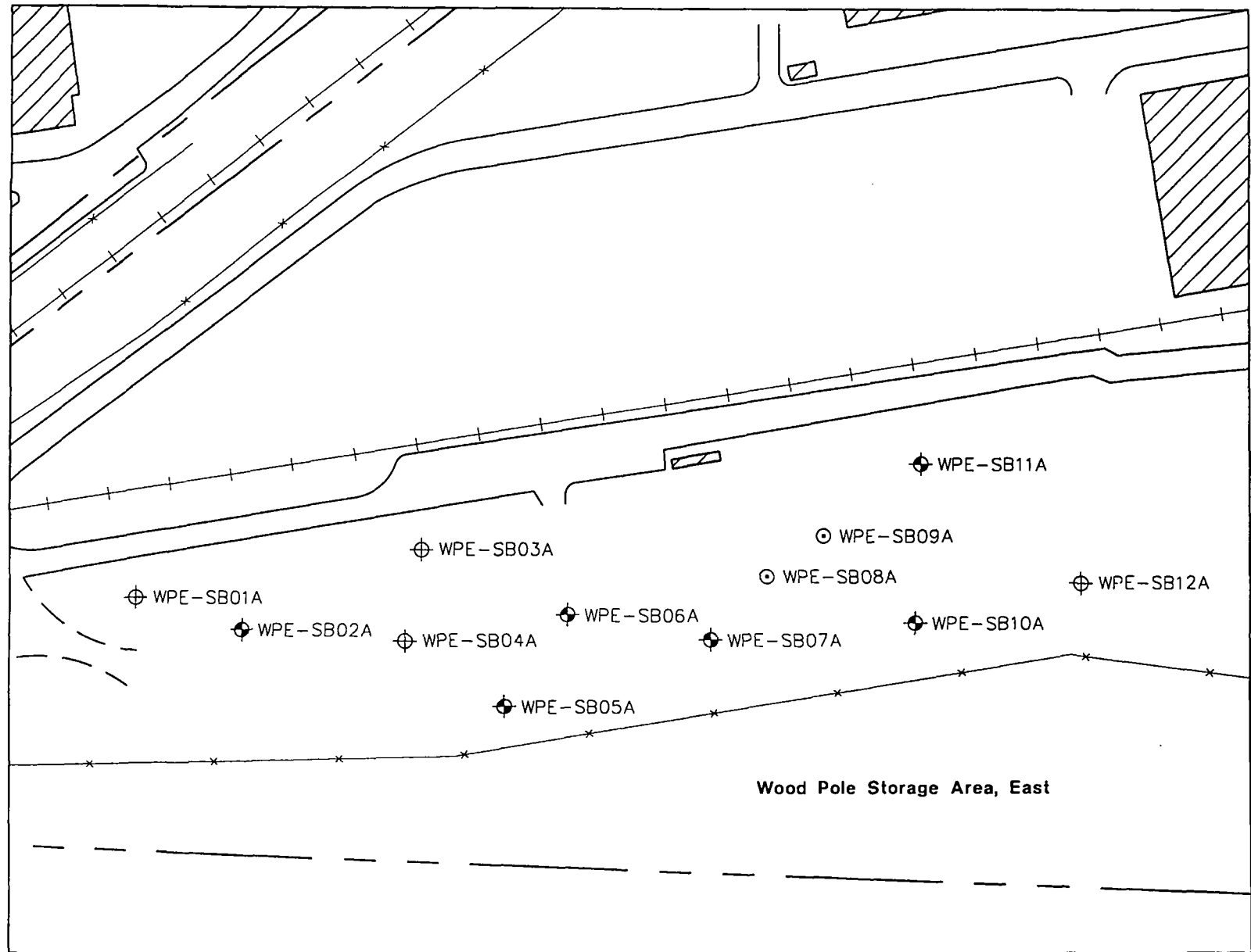
LEGEND

- BPA Ross Complex Boundary
- - - Fence
- - - Rail Road
- ▨ Building
- ⊕ Location of sample(s) having a detected analyte above RAO.
- ⊗ Location of sample(s) having a detected analyte below RAO.
- Location of sample(s) having no detected analyte.

Figure 3
Distribution of Pentachlorophenol (PCP)
Wood Pole Storage Area, East
BPA Ross Complex

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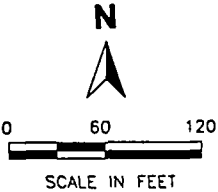
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Concentrations of Total Carcinogenic HPAH in the Wood Pole Storage Area East

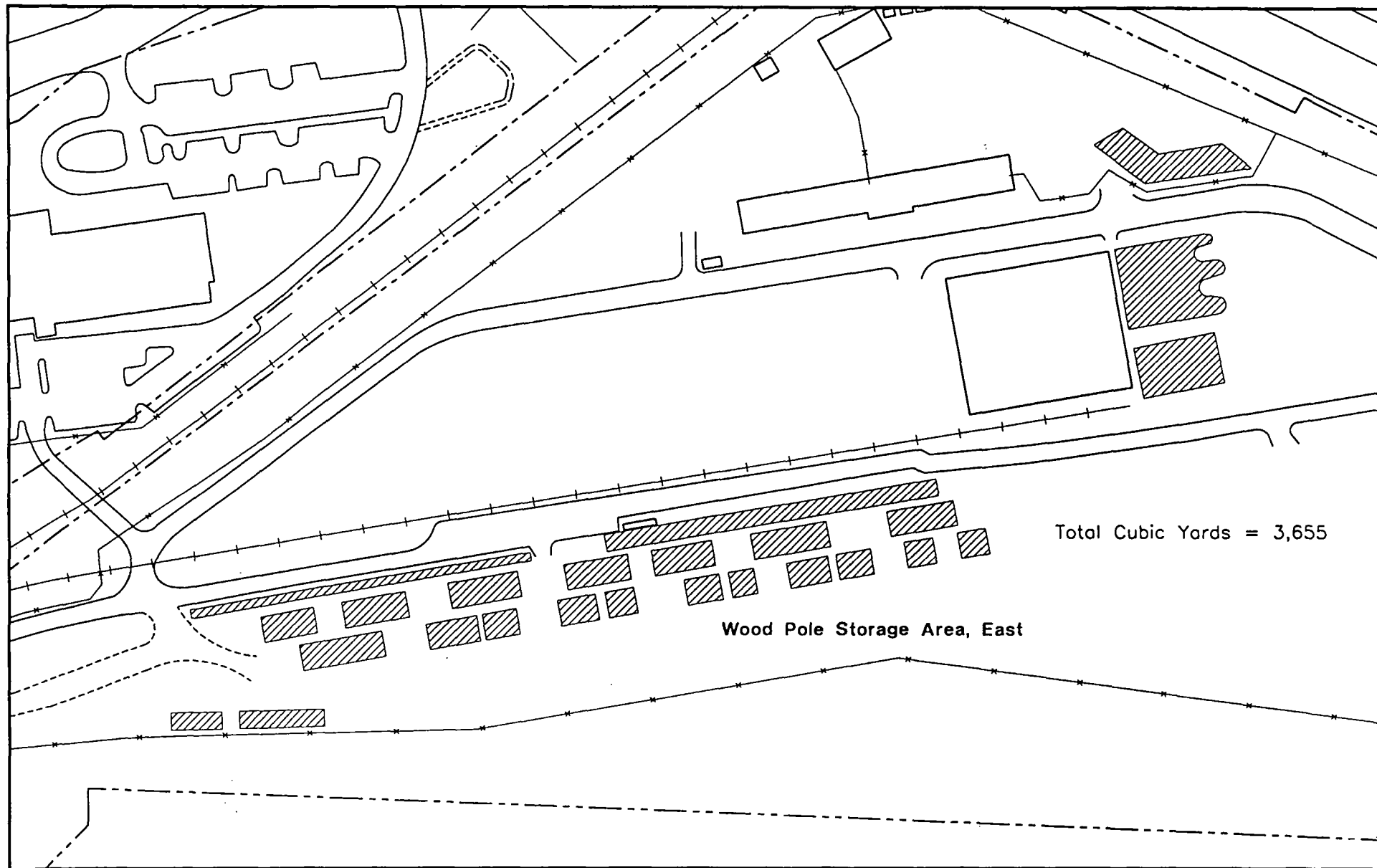
STATION	DEPTH	CONC.	QUAL
WPE-SB01A	0	0.481	
WPE-SB02A	0	479.4	
	7.5	0.007	
WPE-SB03A	3	0.006	
	7.5	0.003	
WPE-SB04A	7.5	0.018	
WPE-SB05A	0	30.27	
WPE-SB06A	0	29.97	
	7.5	0.002	
WPE-SB07A	0	4.88	
WPE-SB10A	0	5.8	
	7.5	0.002	
WPE-SB11A	3	4.7	
WPE-SB12A	3	0.009	

Values reported in ppm.
J - The associated value is an estimated quantity.



LEGEND	
--- BPA Ross Complex Boundary	⊕ Location of sample(s) having a detected analyte above RAO.
--- Fence	⊙ Location of sample(s) having a detected analyte below RAO.
--- Rail Road	⊗ Location of sample(s) having no detected analyte.
▨ Building	

Figure 4
Distribution of Total HPAH
Wood Pole Storage Area, East
BPA Ross Complex
DAMES & MOORE



LEGEND

- BPA Ross Complex Boundary
- Est. Contaminated Areas
- Fence
- Rail Road
- Building

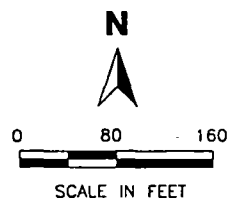


Figure 5
 Estimated Areas of Contaminated Soils
 Wood Pole Storage Area, East
 BPA Ross Complex

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PCBs were the compound of concern identified in soils in the Ross Substation and Capacitor Yard. The Ross Substation and Capacitor Yard is a 10-acre fenced area that contains numerous capacitors and transformers. Spills of PCB oils from faulty capacitors and leaking equipment have occasionally occurred within the substation. Figure 6 shows the distribution of PCB contamination and Figure 7 shows estimated area of contaminated soil, a volume estimate of approximately (1,196 yd³), in the Ross Substation and Capacitor Yard.

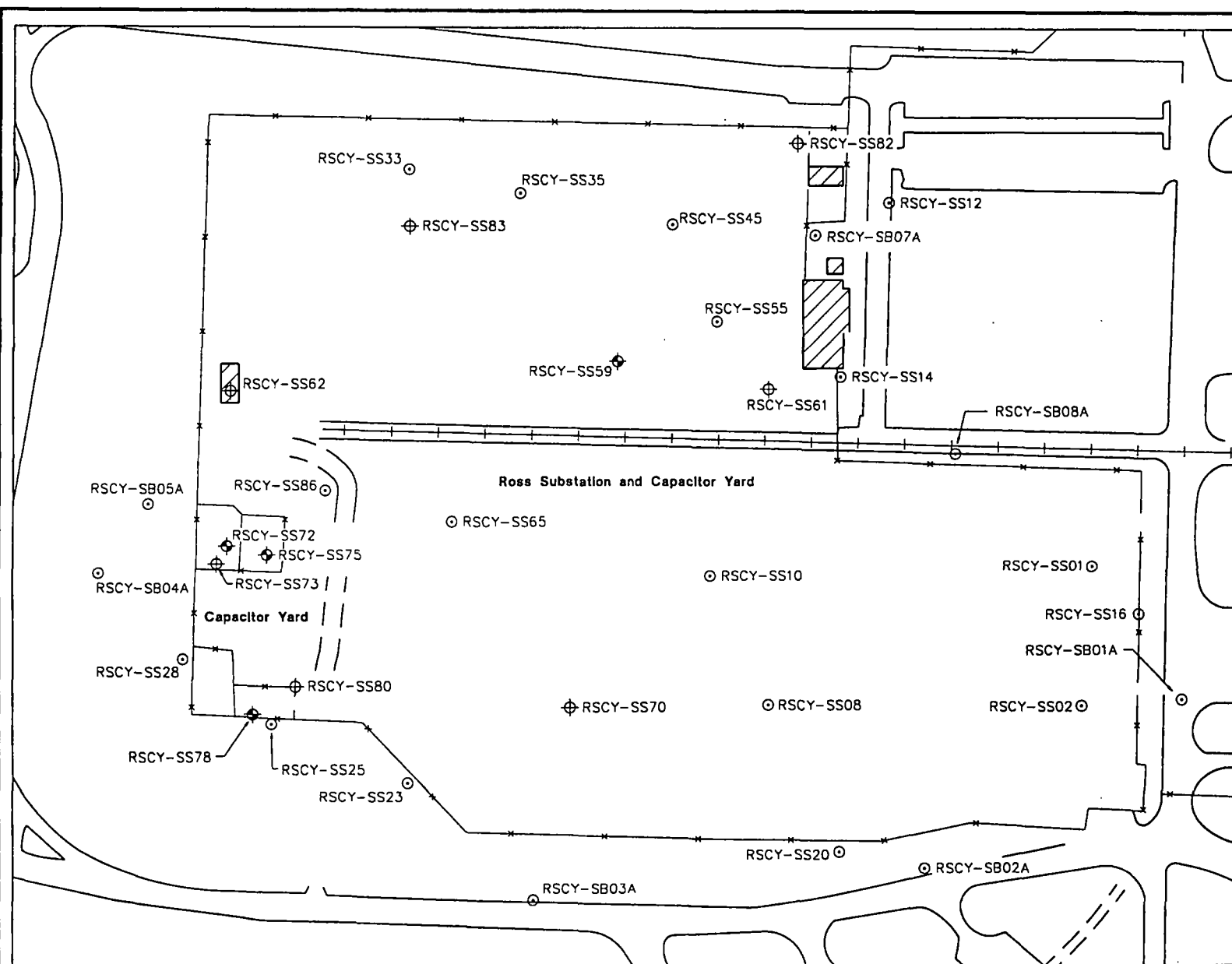
PCBs are the compounds of concern identified in the Capacitor Testing Lab area. PCBs were detected in surface soils around the outside of the Capacitor Testing Lab. Figures 8 and 9 show the distribution of PCB contamination and the estimated area of contaminated soil (volume estimate of approximately 68 yd³) in the Capacitor Testing Lab Area. PCB-containing oils were reportedly spilled onto the concrete floor during storage of the failed capacitors, as well as onto the soil and gravel beyond the garage door. Potential heating of the PCB-containing oils with the capacitors may have produced dioxins.

PCBs are considered to be carcinogenic, are relatively insoluble in water and have a high affinity to sorb to soils. It is unlikely that PCBs will be mobile in soils in either the Ross Substation and Capacitor Yard or the Capacitor Testing Lab based on the physical contaminant characteristics and because soils in these areas are compacted and have low permeability characteristics. PCBs are regulated as a dangerous waste in accordance with WAC-173-303 and are also regulated under TSCA, 40 CFR Part 761.

7.0 SUMMARY OF SITE RISKS

CERCLA response actions for OUA at the BPA Ross Complex site as described in this Record of Decision are intended to protect human health and the environment from current and potential future exposure to hazardous substances in soil at the site. To assess these risks at the site, human health and ecological risk assessments were conducted as part of the remedial investigation to characterize the magnitude of risks associated with exposure to contaminated surface soils and to prioritize areas within OUA for remedial action. Human receptors included a hypothetical on-site residential child and adult (potential future scenario); on-site worker (current industrial scenario); and off-site residential (recreational) child and adult. Ecological indicator species selected for this site included the American robin (*T. migratorius*), raccoon (*P. lotor*), and black-tailed deer (*O. hemionus columbianus*). The results of the risk assessments were used to decide whether remedial action is necessary and then used in the feasibility study for selection of cleanup guidelines to protect human health and the environment.

The approach followed for both the human health and ecological Baseline Risk Assessment consisted of the following general steps: (1) identification of chemicals of potential concern, (2) exposure assessment, (3) toxicity assessment, and (4) risk characterization.



Concentrations of Total PCBs in the Ross Substation and Capacitor Yard

STATION	DEPTH	CONC.	QUAL
RSCY-SS59	0	16	J
RSCY-SS61	0	0.25	J
RSCY-SS62	0	2.57	J
RSCY-SS70	0	0.18	J
RSCY-SS72	0	130	J
RSCY-SS73	0	2.7	J
RSCY-SS75	0	8.9	J
RSCY-SS78	0	112	J
RSCY-SS80	0	0.27	J
RSCY-SS82	0	0.92	J
RSCY-SS83	0	0.36	J
RSCY-SS85	0	0.13	J

Values reported in ppm.

J - The associated value is an estimated quantity.

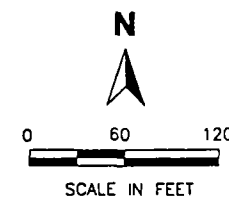


Figure 6
Distribution of Total PCBs
Ross Substation and Capacitor Yard
BPA Ross Complex
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Ross Substation and Capacitor Yard



19 Cubic Yards

579 Cubic Yards

1196 Total Cubic Yards

598 Cubic Yards

N

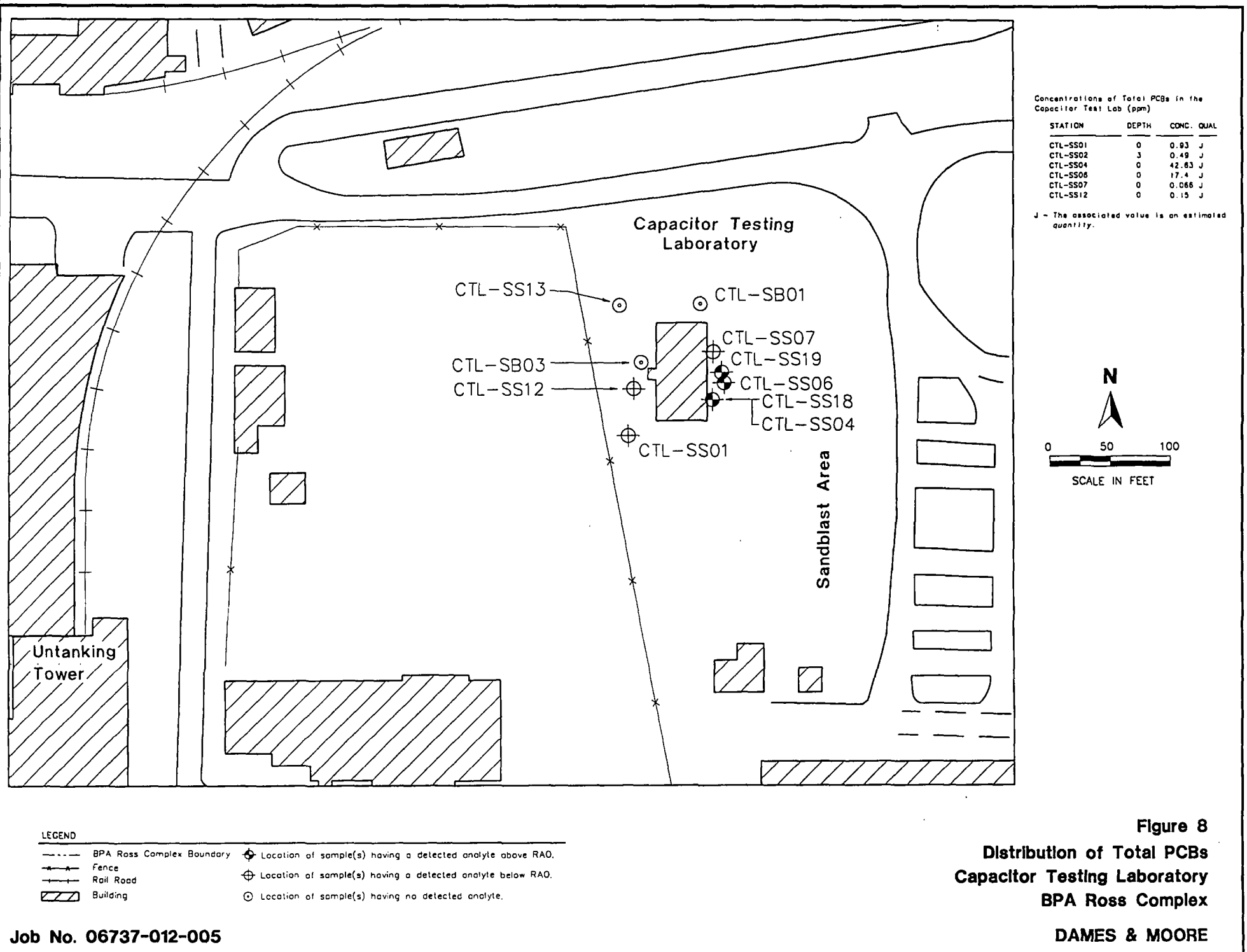


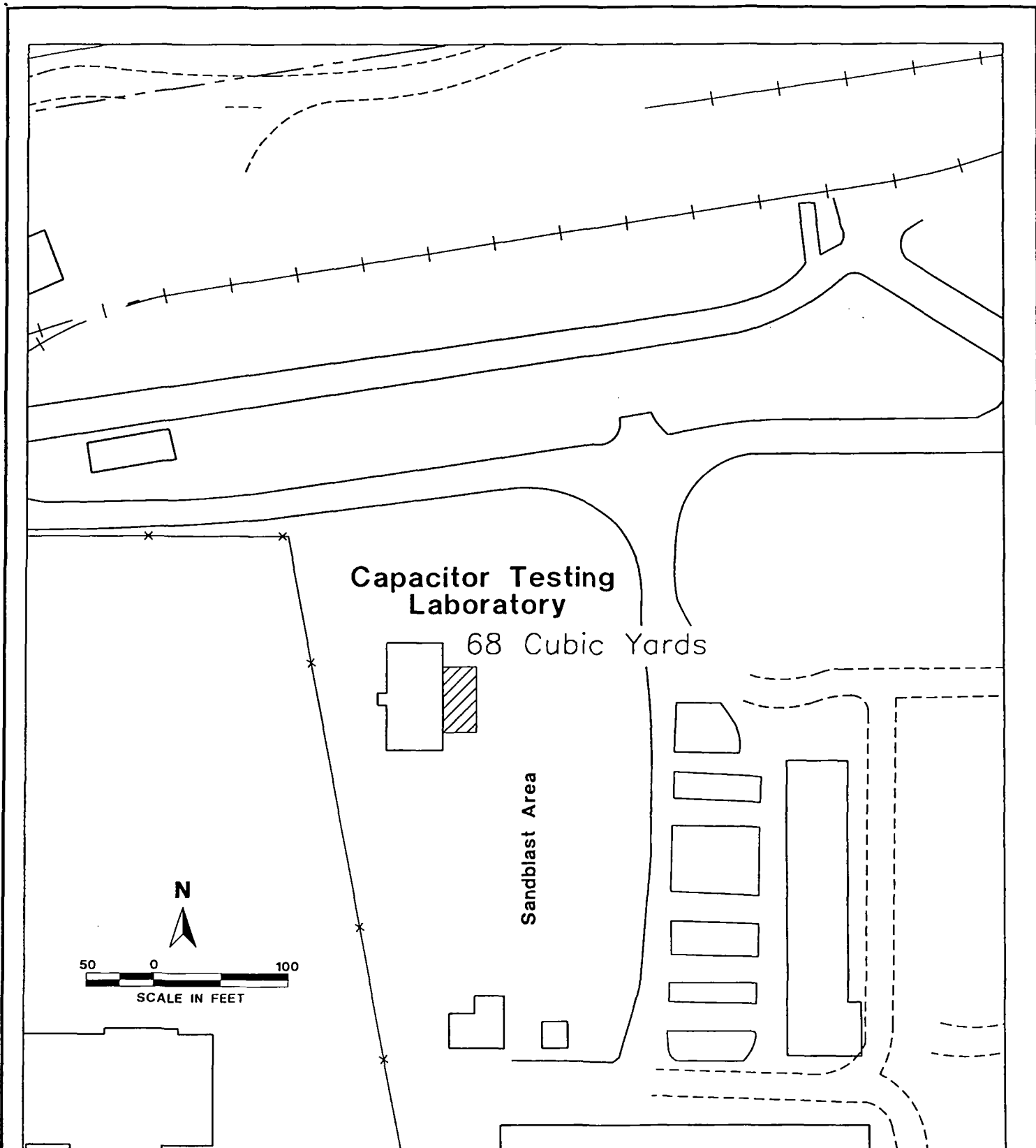
LEGEND

- BPA Ross Complex Boundary
- x-x- Fence
- + + + Rail Road
- [Rectangle] Building
- [Hatched Box] Est. Contaminated Areas

FIGURE 7
ESTIMATED AREAS OF CONTAMINATED SOILS
ROSS SUBSTATION AND CAPACITOR YARD
BPA ROSS COMPLEX

DAMES & MOORE





LEGEND

- BPA Ross Complex Boundary
- x-x- Fence
- + + + Rail Road
- ▭ Building
- ▨ Est. Contaminated Areas

FIGURE 9
ESTIMATED AREAS OF CONTAMINATED SOILS
CAPACITOR TEST LABORATORY
BPA ROSS COMPLEX

7.1 COMPOUNDS OF CONCERN AND USE OF DATA

Twelve compounds of concern were selected from a broader list of chemicals of potential concern identified by the Washington Model Toxics Control Act (MTCA), and EPA regional and national guidance (EPA 1988, EPA 1991) based on comparison with natural and area background soil concentrations, prevalence, and toxicity. The compounds of concern selected for inclusion in the risk assessment are as follows:

- Metals: antimony, arsenic, chromium, copper, lead, zinc.
- Suspected carcinogenic high molecular weight polynuclear aromatic hydrocarbons (HPAH) were evaluated as total HPAHs. The carcinogenic HPAHs considered in the total HPAH are benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3)pyrene, and pyrene. (Benzo(a)pyrene, a carcinogenic HPAH, was considered separately);
- Pentachlorophenol;
- Bis(2-ethylhexyl)phthalate;
- Total polychlorinated biphenyl compounds (PCBs); and
- Dioxin (2,3,7,8-TCDD).

These compounds of concern were carried throughout the baseline risk assessment and were considered in the Feasibility Study. The metals evaluated in the risk assessment were elevated above background levels. Metals including antimony, chromium, copper, lead, and zinc were evaluated as non-carcinogenic compounds. Arsenic, HPAHs, pentachlorophenol, bis(2-ethylhexyl)phthalate, PCBs, and dioxin are evaluated as carcinogenic compounds.

In the risk assessment, the individual waste units addressed in Operable Unit A were grouped into seven larger categories or waste unit groups to evaluate contaminant exposure potential within relatively homogeneous exposure areas. The waste units were organized into Waste Unit Groups (WUG) based on location within the Site, predominant contaminants present, surface water drainage and topography, proximity to biological habitat, and other exposure considerations. No surface soil samples were collected in association with the oil water separators, therefore, this unit was not included in a waste unit group. The waste units within each group are listed as follows:

Waste Unit Group	Waste Unit
1	Van's Way Oils Storage Wood Pole Storage Area East
2	Utilization and Disposal Yard Hazardous Waste Storage Building Herbicide Storage Area
3	Capacitor Testing Lab Paint Storage Facility Plumbing Shop ("Paint Shop") PCB Storage Building
4	Sand Blast Area

5	Laboratory Waste Storage Area Untanking Tower
6	Ross Substation and Capacitor Yard
7	DOB-1 and DOB-2 Drainfields Top Coat Test Area DOB-1 Drainline Wood Pole Storage Area South Ellen Davis Trail

Samples with chemicals reported as undetected were assumed to contain these constituents at 1/2 the sample quantitation limit for the purpose of calculating averages, as recommended by EPA guidance (EPA, 1989a). The Baseline RA was conducted for all chemical data sets based on the 95 percent upper confidence limit (UCL) of the average concentrations in soil. The 95th UCL is utilized at the reasonable maximum exposure (RME) value used in the risk assessment. The RME is defined as the highest potential exposure expected to occur at a site (EPA, 1989a).

7.2 HUMAN HEALTH RISK ASSESSMENT

This section summarizes the exposure assessment, toxicity assessment and the risk characterization associated with the indicator chemicals evaluated in the human health risk assessment.

7.2.1 Exposure Assessment

The exposure assessment characterizes the general setting in which potential exposures could occur, including the physical setting and accessibility to contaminated areas; defines potentially exposed populations; identifies exposure pathways; defines the approach for quantifying exposures, including selection of numerical exposure factors; and estimation of chemical intake.

7.2.1.1 Site Setting

The exposure assessment emphasizes potential exposures associated with current land use activities, comprising the baseline scenario, both on and around the site. In addition, in compliance with EPA Region 10 guidelines (EPA, Region 10, 1991), a hypothetical on-site residential scenario, addressing potential exposures of potential future residents is included in the quantitative risk assessment. This scenario is included to consider all potential exposures but is not regarded as likely given the presumed continued land use designation of the BPA Ross Complex as a power distribution facility.

The area surrounding the Site exhibits a variety of land uses. These include residential (south, southwest, and southeast), light commercial/industrial (east and northeast), major highways and thoroughfares (west (primarily), north, east (secondarily)), and open space (north, southeast, west). Exposure scenarios are consistent with this diversity of land use.

The Complex is generally fenced. Open (i.e., accessible) areas exist primarily in the southern section of the Complex. Site access by adjacent residents could occur near the southern (19th Avenue) entrance to the Site, where no steep slopes, bushy vegetation, fences or other controls restrict access. These areas include the Ellen Davis Trail, and Wood Pole Storage-South, which are in Waste Unit Group #7.

Workers are assumed to have unlimited access to the Site through work-related duties. Hypothetical on-site residents are also assumed to have unlimited access to the site. Off-site residents are presumed exposed in areas where unrestricted access exists, which is primarily on the southern perimeter of the Site. There is no known human habitation on the Complex except for transients which reportedly occupy the northern portion of the Complex near the Cold Creek landfill. Potential exposures will be addressed as part of the Operable Unit B Baseline risk assessment.

7.2.1.2 Potentially Exposed Populations

The human receptor groups that were evaluated in the baseline risk assessment included on-site workers, hypothetical on-site residents, and off-site residents using portions of the site recreationally. Table 3 provides a description and summary of the various human receptor groups (both on- and off-site) considered for the Baseline RA. Hypothetical on-site residential exposures to site-related contaminants could also occur in several areas on the Site from several different waste units. This hypothetical scenario assumes that at some point in the future the Ross Complex would no longer be used as a power distribution facility, but that on-site contaminant levels would remain the same. Several potential pathways could be involved, based on surface soils, surface water, and air.

Two residential receptor "age-classes" were evaluated. These included children aged 0 to 6 and "adults" aged 6 to 75. This distinction is believed to most effectively address the different types of potential exposures occurring within human receptor groups.

Exposures to on-site workers could occur at several areas of the Site based on direct contact with Soils (including dermal contact, incidental ingestion, and inhalation). On-site workers were not assumed to ingest produce grown on-site or fish/shellfish taken from adjoining creeks. Because numerous activities occur on the Site near contaminated areas, exposure durations and other factors were evaluated based on conservative RME exposure factors.

Off-site residential exposures to site-related contaminants evaluated in this risk assessment were limited to recreational use of WUG #7. Some direct contact with Operable Unit A Soils is also possible at the southern portion of the Site where site access is not restricted.

A large portion of the southeastern area is bordered by a greenbelt through which the eastern portion of the Ellen Davis trail passes. Consideration of residents around the Site was limited because of Interstate I-5 and other major thoroughfares assumed to compound and obscure potential impacts from the Ross Complex. In addition, the area to the west (near the Ellen Davis trail) is generally open space with woodland, vacant lots, and riparian areas. Potential exposures of residents living near the Site are quantitatively addressed through evaluation of the hypothetical assumption that contaminated fish and shellfish are consumed and incidental contact with creek waters represented by Cold Creek and Burnt Bridge Creek occurs.

Table 3

Description and Selection of Complete Potential Human Exposure Pathways by Receptor
Operable Unit A
BPA Ross Complex RI

Potential Receptor	Route, Medium, and Point of Exposure	Basis for Selection
Off-site Residents	Incidental ingestion of soils	Assumes that soils could be contaminated via aerial deposition or surface water runoff.
	Dermal contact with soils	Assumes that soils could be contaminated via aerial deposition or surface water runoff.
	Ingestion of homegrown fruits and vegetables	Assumes that plants may be irrigated with contaminated water, planted in contaminated soil, or that windborne contaminants would be deposited on plant surfaces.
	Incidental ingestion of surface water or sediment from Burnt Bridge or Cold Creek	Assumes that contaminants could be taken up by human receptors during swimming activities.
	Dermal contact with surface water or sediment from Burnt Bridge or Cold Creek.	Assumes that contaminants could be taken up by human receptors during swimming activities.
	Ingestion of fish/shellfish	Assumes that Ross Complex contaminants could be taken up by aquatic organisms and ingested by human consumers.
	Inhalation of wind-borne particulates from exposed surface soils	Assumes that soil-borne contaminants could be transported to off-site soils.
Hypothetical On-Site Residents	Inhalation of vapor-phase chemicals transported off-site	Considered highly unlikely, in part because most of the site is paved, but was addressed as Baseline RA pathway.
	Incidental ingestion of soils	Assumes ingestion of on-site soils.
	Dermal contact with soils	Assumes dermal contact with on-site soils.
	Ingestion of homegrown fruits and vegetables	Assumes that plants may be irrigated with contaminated water, planted in contaminated soil, or that windborne contaminants would be deposited on plant surfaces.

Table 3

Description and Selection of Complete Potential Human Exposure Pathways by Receptor
 Operable Unit A
 BPA Ross Complex RI

Potential Receptor	Route, Medium, and Point of Exposure	Basis for Selection
Hypothetical On-Site Residents (cont.)	Incidental ingestion of surface water or sediment from Burnt Bridge or Cold Creek	Assumes that contaminants could be taken up by human receptors during swimming activities.
	Dermal contact with surface water or sediment from Burnt Bridge or Cold Creek.	Assumes that contaminants could be taken up by human receptors during swimming activities.
	Ingestion of fish/shellfish	Assumes that Ross Complex contaminants could be taken up by aquatic organisms and ingested by human consumers.
	Inhalation of wind-borne particulates from exposed surface soils	Assumes that soil-borne contaminants are transported into the air onsite.
	Inhalation of vapor-phase chemicals emitted from site	Considered highly unlikely. In part because most of the site is paved, but was addressed as Baseline RA pathway.
Ross Complex workers	Incidental ingestion of soils during work activities	This pathway assumes that soils could be contaminated via aerial deposition, surface water runoff, or direct waste disposal to soils.
	Dermal contact with soils during work activities	This pathway assumes that soils could be contaminated via aerial deposition, surface water runoff, or direct waste disposal to soils.
	Inhalation of wind-driven particulates from exposed soils	Assumes exposure to wind-evolved soils using empirical models.
	Inhalation of vapor-phase chemicals emitted from site	Addressed based on Phase I (modeling and/or air monitoring) plan.

FOOTNOTES

(a) Contaminant-specific information such as absorption coefficients for different routes, bioconcentration factors, and other exposure-related properties were incorporated into the exposure assessment, but are not presented in this table.

7.2.1.3 Identification of Exposure Pathways

Exposure pathways selected for evaluation in the risk assessment were: 1) incidental ingestion of contaminated soil and dust; 2) dermal contact with contaminated soil; 3) ingestion of contaminated produce; 4) incidental ingestion of surface water; 5) dermal contact with sediments; 6) ingestion of contaminated fish/shellfish; 7) inhalation of contaminated particles; and 8) inhalation of organic vapors. Surface soils were the principle source of contamination evaluated in the baseline risk assessment for Operable Unit A. Potential pathways were based on the three receptor groups (off-site residents who use Waste Unit Group #7 for recreational purposes, hypothetical on-site residents, and on-site workers) discussed above and summarized on Table 3.

Table 3 depicts the rationale for selection of the potential exposure pathways for each of the three receptor groups (off-site residents, on-site workers, hypothetical on-site residents) including route, medium and exposure point, and basis for selection. For on-site workers and hypothetical on-site residents, seven pathways were evaluated and six were evaluated for off-site residents. Inhalation or other exposure to fugitive dust was evaluated for the RI for both on-site and off-site receptors. Grain size analysis of on-site soils indicates that these soils are not subject to wind erosion, therefore this pathway was not included in the quantitative assessment. Guidance for numerical exposure factors was generally obtained from EPA (e.g., EPA 1989a; 1989b; Region 10 1991, 1991c, 1991b) or the open literature.

7.2.2 Toxicity Assessment

This section summarizes the toxicological basis for all compound-specific toxicity criteria required to conduct the Baseline Risk Assessment. These criteria, based on available quantified dose-response toxicity data, are developed and reviewed within various offices of EPA. Summaries of the basis from which toxicological values were derived are presented below.

7.2.2.1 Non-Carcinogenic Effects

For noncarcinogenic chemicals, the reference doses (RfD) are used as benchmarks for toxic endpoints of concern. The goal in developing a RfD is to identify the highest no-observed-adverse-effect level (NOAEL) or the lowest-observed-adverse-effect-level (LOAEL) from well-designed human or animal studies. Uncertainty factors from 1 to 1,000 are incorporated to adjust this level based on the following considerations: 1) the duration of the experimental exposure, 2) effects elicited (if any), 3) extrapolation of the data to other species (such as extrapolation from animals to humans), and 4) sensitive subgroups. Additional modifying factors varying between 1 and 10 may also be incorporated in the derivation of the RfD if additional considerations are necessary. RfD and slope factors for the BPA risk assessment were taken from EPA's computerized Integrated Risk Information System (IRIS); Health Effects Assessment Summary Tables (HEAST); Drinking Water Health Advisories; or personal communication with EPA Region 10 Risk Assessment staff.

The toxicological characterization of compounds of concern was generally confined to chronic (i.e., lifetime) rather than acute or subchronic exposures. This characterization is consistent with the contaminant concentrations found on-site, EPA guidance (EPA, 1989) and exposures likely to occur on site.

7.2.2.2 Carcinogenic Effects

For carcinogenic chemicals, slope factors are estimated using a conservative mathematical model which estimates the relationship between experimental exposure (i.e., doses) and the development of cancer

(i.e., response) that is derived from human or animal studies. Since there is much uncertainty in the dose-response values generated using this procedure, the upper 95 percent confidence limit of the slope of the dose-response curve is normally used in deriving the slope factor.

7.2.3 Risk Characterization

The exposure and toxicity assessments form the basis for the characterization of chemical risks posed by the Site. Carcinogenic risk is estimated as the incremental probability of an individual developing cancer in excess of the normal background population incidence over a lifetime as a result of exposure to a chemical either known or suspected to cause cancer. To estimate cancer risk, slope factors are combined with site exposure information to estimate the incremental cancer risk, which represents a probability of contracting cancer, and which is usually expressed in scientific notation (e.g., $1E-04$). An excess lifetime risk of $1E-04$ indicates that, as a plausible upper bound, an individual has a one-in-ten-thousand chance of developing cancer in a lifetime as a result of site-related exposure to a carcinogen.

For known or suspected carcinogens, acceptable exposures are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual of between $1E-04$ and $1E-06$, using information on the relationship between dose and response (NCP 1990).

For non-carcinogens, the measure used to describe the potential for toxicity in an individual is not expressed as a probability. The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specific period (e.g., lifetime) with a reference dose derived for a similar exposure period. This ratio of exposure to toxicity is called a Hazard Quotient. The Hazard Index (HI) is the sum of more than one hazard quotient for multiple substances and/or multiple exposure pathways. Potential noncarcinogenic effects may be of concern if the HI exceeds unity (i.e., $HI > 1$).

7.2.3.1 Evaluation of On-Site Risks

Results of the Baseline RA indicated that the sum of lifetime cancer risk estimates for all chemicals of concern for on-site workers and hypothetical on-site residential child and adult in each Waste Unit Group 2, 4, 5, and 7 ranged from $6.3E-06$ to $6.7E-5$ (Table 4). The highest risk was associated with WUG #4 and was principally related to arsenic. All hazard quotients were below 1 except for antimony (1.45) in Waste Unit Group #4. The estimated HQ for antimony found in Waste Unit Group 4 (Sand Blast Area) was for the hypothetical on-site residential child. Risks associated with the contaminants present in the Sandblast Area have been removed since this area underwent a removal action.

For Waste Unit Groups, 1, 3, and 6, total cancer risk estimates ranged from $4.4E-05$ to $2.1E-04$. Waste Unit Group #1 is located in the northeast corner of the site and consists of two individual waste units (Van's Way Oil Storage Area and Wood Pole Storage Area East). Total cancer risk estimates for all three receptors, on-site worker and hypothetical on-site child and adult, ranged from $8.9E-05$ to $2.1E-04$. Total HPAHs accounted for approximately 91% to 95% of the projected risk for each on-site receptor. The occurrence of HPAHs were generally laterally extensive in the Wood Pole Storage Area East and only at spot locations in Van's Way Oil Storage Area. Hazard Quotient estimates for non-carcinogenic compounds in Waste Unit Group 1 were below the Hazard Index of 1; therefore, adverse health effects associated with the non-carcinogenic compounds evaluated are not expected to occur in this area of the Site.

Waste Unit Group 3 is located in the central industrial core of the Site and consists of four individual waste units, Capacitor Testing Lab, Paint Storage Facility, Plumbing Shop and PCB Storage Area. Total cancer risk estimates for the on-site receptors ranged from $4.4E-05$ to $1.2E-04$.

Table 4

Estimated Hazard Quotients and Lifetime Cancer Risk, Hypothetical On-Site Residential and Occupational Receptors
Operable Unit A
BPA Ross Complex RI

Compound	Based on UCL1		
	Hypothetical On-Site Residential Adult	Hypothetical On-Site Residential Child	On-Site Worker
Waste Unit Group #1			
<u>Hazard Quotient</u>			
Chromium	0.04	0.10	<0.01
Copper	0.04	0.19	<0.01
Lead	0.04	0.16	<0.01
Zinc	0.01	0.01	<0.01
Contribution from lead =	---	---	---
Total HPAHs	8.1E-05	2.0E-04	9.2E-05
Benzo(a)pyrene	4.1E-05	9.7E-05	4.5E-05
Pentachlorophenol	3.3E-06	9.3E-06	4.4E-06
Bis (2-ethylhexyl) phthalate	3.1E-06	7.8E-07	<1.0E-07
Total PCBs	1.3E-06	2.6E-06	9.8E-07
sum of cancer risk ¹ =	8.9E-05	2.1E-04	9.7E-05
Percent risk attributable to total HPAHs, pentachlorophenol, and total PCBs =	96.51%	99.63%	100.00%
Waste Unit Group #2			
<u>Hazard Quotient</u>			
Chromium	0.05	0.10	<0.01
Copper	0.04	0.18	<0.01
Lead	0.02	0.11	<0.01
Zinc	0.01	0.01	<0.01
Contribution from lead =	---	---	---
Total HPAHs	1.5E-05	2.7E-05	1.2E-05
Benzo(a)pyrene	1.3E-05	2.6E-05	1.2E-05
Pentachlorophenol	1.1E-07	3.0E-07	1.4E-07
Bis (2-ethylhexyl) phthalate	3.1E-06	6.3E-07	<1.0E-07
Total PCBs	1.5E-06	3.3E-06	1.2E-06
sum of cancer risk ¹ =	1.9E-05	3.1E-05	1.4E-05
Percent risk attributable to total HPAHs, pentachlorophenol, and total PCBs =	84.18%	97.97%	100.00%
Waste Unit Group #3			
<u>Hazard Quotient</u>			
Chromium	0.08	0.15	<0.01
Copper	<0.01	0.21	<0.01
Lead	0.08	0.32	0.01
Zinc	0.01	0.02	<0.01
Contribution from lead =	---	---	---
Total HPAHs	5.9E-06	4.5E-06	1.7E-06
Benzo(a)pyrene	4.9E-06	5.2E-06	2.2E-06
Pentachlorophenol	5.9E-07	1.7E-06	7.8E-07
Bis (2-ethylhexyl) phthalate	3.1E-06	6.4E-07	<1.0E-07
Total PCBs	4.4E-05	1.1E-04	4.1E-05
Total CDD/CDF	4.4E-07	1.5E-06	4.1E-07
sum of cancer risk ¹ =	5.4E-05	1.2E-04	4.4E-05
Percent risk attributable to total HPAHs, pentachlorophenol, and total PCBs =	93.44%	98.29%	99.05%

Footnotes

¹ The risk calculated for benzo(a) pyrene is not included in the sum of cancer risk value. B(a)P is accounted for in the total HPAH risk value.

Table 4

Estimated Hazard Quotients and Lifetime Cancer Risk, Hypothetical On-Site Residential and Occupational Receptors
Operable Unit A
BPA Ross Complex RI

Compound	Based on UCL1		
	Hypothetical On-Site Residential Adult	Hypothetical On-Site Residential Child	On-Site Worker
Waste Unit Group #4			
Hazard Quotient			
Antimony	0.89	1.45	0.02
Chromium	0.19	0.29	< 0.01
Copper	0.08	0.22	< 0.01
Lead	0.32	1.17	0.04
Zinc	0.07	0.11	< 0.01
Contribution from lead =	—	—	—
Arsenic	6.0E-05	2.1E-05	1.6E-06
Total HPAHs	3.5E-06	5.1E-06	2.0E-06
Benzo(a)pyrene	1.5E-06	1.1E-06	2.5E-07
Pentachlorophenol	6.6E-07	1.8E-06	8.8E-07
Bis (2-ethylhexyl) phthalate	1.3E-06	9.6E-07	1.8E-07
Total PCBs	1.3E-06	2.7E-06	1.0E-06
sum of cancer risk ¹ =	6.7E-05	3.2E-05	5.6E-06
Percent risk attributable to total HPAHs, pentachlorophenol, and total PCBs =	8.09%	30.58%	69.01%
Waste Unit Group #5			
Hazard Quotient			
Chromium	0.05	0.11	< 0.01
Copper	0.11	0.39	0.01
Lead	0.07	0.28	0.01
Zinc	0.01	0.02	< 0.01
Contribution from lead =	—	—	—
Total HPAHs	9.8E-06	1.4E-05	6.3E-06
Benzo(a)pyrene	5.1E-06	5.8E-06	2.4E-06
Pentachlorophenol	9.4E-07	2.6E-06	1.2E-06
Bis (2-ethylhexyl) phthalate	3.1E-06	7.1E-07	<1.0E-07
Total PCBs	1.1E-05	2.9E-05	1.0E-05
sum of cancer risk ¹ =	2.5E-05	4.6E-05	1.8E-05
Percent risk attributable to total HPAHs, pentachlorophenol, and total PCBs =	87.63%	98.47%	100.00%
Waste Unit Group #6			
Hazard Quotient			
Antimony	0.24	0.35	0.00
Chromium	0.07	0.12	< 0.01
Copper	0.07	0.17	< 0.01
Lead	0.44	1.67	0.05
Zinc	0.01	0.02	< 0.01
Contribution from lead =	—	—	—
Total HPAHs	2.1E-06	1.7E-06	3.8E-07
Benzo(a)pyrene	1.8E-06	2.0E-06	6.7E-07
Pentachlorophenol	6.4E-07	1.8E-06	8.6E-07
Bis (2-ethylhexyl) phthalate	1.2E-06	6.7E-07	<1.0E-07
Total PCBs	7.6E-05	2.0E-04	7.2E-05
sum of cancer risk ¹ =	8.0E-05	2.0E-04	7.3E-05
Percent risk attributable to total HPAHs, pentachlorophenol, and total PCBs =	98.44%	99.67%	100.00%

Footnotes

¹ The risk calculated for benzo(a) pyrene is not included in the sum of cancer risk value. B(a)P is accounted for in the total HPAH risk value.

Table 4

Estimated Hazard Quotients and Lifetime Cancer Risk, Hypothetical On-Site Residential
and Occupational Receptors
Operable Unit A
BPA Ross Complex RI

Compound	Based on UCL1		
	Hypothetical On-Site Residential Adult	Hypothetical On-Site Residential Child	On-Site Worker
Waste Unit Group #7			
Hazard Quotient			
Chromium	0.16	0.26	< 0.01
Copper	0.03	0.16	< 0.01
Lead	0.17	0.70	0.02
Zinc	< 0.01	< 0.01	< 0.01
Contribution from lead =	—	—	—
Arsenic	3.6E-05	1.1E-05	7.5E-07
Total HPAHs	5.3E-06	2.9E-06	9.5E-07
Benzo(a)pyrene	3.3E-06	1.1E-06	2.5E-07
Pentachlorophenol	1.0E-07	2.9E-07	1.4E-07
Bis (2-ethylhexyl) phthalate	3.1E-06	6.1E-07	<1.0E-07
Total PCBs	4.9E-06	1.2E-05	4.4E-06
sum of cancer risk ¹ =	5.0E-05	2.7E-05	6.3E-06
Percent risk attributable to total HPAHs, pentachlorophenol, and total PCBs =	20.93%	57.23%	88.07%

Footnotes

¹ The risk calculated for benzo(a) pyrene is not included in the sum of cancer risk value. B(a)P is accounted for in the total HPAH risk value.

The estimated total cancer risk of 4.4×10^{-5} was found for the on-site worker. Total PCBs accounted for approximately 91% of the projected risk for the on-site worker in Waste Unit Group 3 and were predominantly found in the Capacitor Testing Lab. Total PCBs occurrences were present in a localized area in the Capacitor Testing Lab and at spot locations in the Paint Storage Facility, Plumbing Shop and PCB Storage Area. Hazard Quotient estimates for non-carcinogenic compounds in Waste Unit Group 3 were below the Hazard Index of 1; therefore, adverse health effects associated with the non-carcinogenic compounds evaluated are not expected to occur in this area of the Site.

Waste Unit Group #6 consists of one waste unit, the Ross Substation and Capacitor Yard, which is enclosed by a fence with restricted access. The sum of cancer risk estimates for all three receptors, on-site worker and hypothetical on-site child and adult, ranged from $8.0\text{E-}05$ to $2.0\text{E-}04$. The occurrences of total PCBs in this Waste Unit Group is comprised of spot locations. Total PCBs accounted for approximately 95% to 100% of the projected risk for each on-site receptor in this area.

Although lead was found in Waste Unit Group #6 above background, modeling results from the EPA Uptake/Biokinetic Model (conducted for children, the most sensitive indicator) suggested no evidence of elevated hazard at reported soil levels for WUG #6.

7.2.3.2 Evaluation of Off-Site Risks

The risk to off-site residents including adult and child as potential receptors was focused on Waste Unit Group 7 (Wood Pole Storage Area East). This area is located on the southern Site perimeter and is the only waste unit group that has unrestricted access to off-site residents. The risk was assessed through exposure by potential recreational use since other routes have not been found to be significant. The lifetime cancer risk estimates for both off-site and recreation receptors related to Waste Unit Group 7 range from $1.2\text{E-}06$ to $<1.0\text{E-}07$ which is below EPA's acceptable cancer risk range (Table 5).

Hazard Quotient estimates for non-carcinogenic compounds in the evaluation of off-site receptors were below the Hazard Index of 1; therefore, adverse health effects are not expected off-site.

7.2.4 Uncertainty

Major components of the assessment which decreased the certainty of other results were 1) the toxicity reference values used, and the lack of values for several chemicals; 2) limitations in contaminant concentration data for soils, ground water, and surface water; 3) the inclusion of concentrations at a level one-half the detection limit for many chemicals; and 4) the use of a number of assumptions to establish exposure parameters in computing chemical intakes.

Due to uncertainty in these and other areas, conservative assumptions were made in order to ensure protection of human health. Cancer and non-cancer risk estimates must be carefully interpreted, particularly when evaluating noncarcinogenic effects where uncertainty factors of two to three orders of magnitude are used in dose-response assessments.

Although most parameters addressed and included in the Baseline RA are inexact, all are designed to be conservative and therefore, are protective of all receptors considered.

Table 5

**Estimated Hazard Quotients and Lifetime Cancer Risk, Off-site Recreational Receptors
Operable Unit A
BPA Ross Complex RI**

Compound	Based on 95% UCL for WUG #7	
	Adult	Child
<u>Hazard Quotient</u>		
Chromium	0.02	0.07
Copper	0.05	0.14
Lead	0.05	0.30
Zinc	<0.01	<0.01
Arsenic	4.3E-06	3.3E-06
Total HPAHs	2.2E-06	1.5E-06
Benzo(a)pyrene	8.5E-07	5.2E-07
Bis (2-EH) phthalate	1.2E-06	6.0E-07
Pentachlorophenol	<1.0E-07	<1.0E-07
Total PCBs	2.5E-06	4.8E-06
sum of cancer risk =	1.0E-05	1.0E-05

7.3 ECOLOGICAL RISK ASSESSMENT

The Baseline Ecological Risk Assessment was an evaluation of the potential threats to the environment from the Site in the absence of any remedial action. It identified potential on or off-site exposures of environmental receptors inhabiting the area to chemicals of concern, characterizes the toxicological properties of "indicator" chemicals, and quantifies the extent to which exposures may contribute to ecological risk or degradation under the conditions defined for the Site.

The terrestrial components of the ecological risk assessment included: (1) identifying "indicator" chemicals (previously discussed); (2) identifying potential exposure pathways; and (3) identifying biological habitat and potentially exposed wildlife (or other) receptors.

The overall approach to both the human health and ecological portions of the baseline risk assessment are similar, especially in utilizing a Reasonable Maximum Exposure (RME) approach to addressing potential ecological exposures. Key differences include: (1) the ecological risk assessment addresses chronic toxicity (based on available dose-response data, rather than considering carcinogenicity as an endpoint); and (2) several wildlife indicator species are identified to represent all potentially susceptible receptors. The May 1992 Operable Unit A RI report discusses the physical setting in which potential ecological exposures could take place, including characterization of biological habitat and identification of indicator species and potentially exposed populations.

For the ecological risk assessment, three key "indicator" species were identified, including the American robin, Raccoon, and Black-tailed deer. These species were selected based on criteria intended to ensure that no other species are likely to be more exposed than the indicator species, and that they are representative of the potentially most sensitive species or organisms present at the Site. These criteria include: sensitivity to contaminants of concern; habitation within Clark county and potentially the vicinity of the Site; valued or protected species (e.g., rare or endangered, game species, etc.), to ensure that protected organisms are considered; a mixture of avian/mammalian species designed to address a variety of life histories and feeding habits; representativeness of the potential for contaminant bioaccumulation (addressing predation as a primary feeding habit); and representativeness of local biological communities. No threatened or endangered species were observed at the Site or adjacent to the site.

7.3.1 Risk Characterization

Results shown on Table 6 indicate the total exposure and contribution by individual pathway for the Baseline Ecological RA. Results are based on the 95% upper confidence limits (UCL values) by Waste Unit Group, by terrestrial ecological receptor, and by "indicator" contaminant. Similar to the non-carcinogenic analysis of the human health component, when the HQ value is less than one, no chronic toxicity associated with Site contaminants is expected. It is conservatively assumed for the purposes of the analysis that all three indicator species (robin, raccoon, deer) could be present at any of the seven Waste Unit Groups of Operable Unit A.

The results of the exposure assessment indicate that the five metals for which HQ values exceeded one included antimony (Waste Unit Groups 4 and 6), arsenic (Waste Unit Group 4), chromium (Waste Unit Groups 4 and 7), copper (Waste Unit Group 5), and lead (Waste Unit Groups 4, 6, and 7). No threshold values were exceeded for the black-tailed deer; potential chronic effects could be expected for the robin only for antimony and chromium, while potential chronic effects could be expected for the raccoon only for arsenic, copper, and lead.

Table 6

Ecological Hazard Quotients by Contaminant, Terrestrial Receptors

Operable Unit A

BPA Ross Complex RI

Compound	American Robin (<i>T. migratorius</i>)	Raccoon (<i>P. lotor</i>)	Black tailed Deer (<i>O. columbianus</i>)
Waste Unit Group #1			
Arsenic	0.05	0.67	0.15
Copper	0.02	0.39	0.04
Lead	<0.01	0.16	0.03
Zinc	0.08	0.08	0.01
Total HPAHs	0.70	0.08	0.02
Benzo (a) pyrene	0.14	0.07	0.02
Bis (2-EH) phthalate	0.01	<0.01	<0.01
Pentachlorophenol	0.25	0.01	<0.01
Total PCBs	0.02	<0.01	<0.01
Waste Unit Group #2			
Arsenic	0.03	0.43	0.10
Copper	0.02	0.33	0.03
Lead	<0.01	0.07	0.01
Zinc	0.06	0.06	0.01
Total HPAHs	0.13	0.01	<0.01
Benzo (a) pyrene	0.05	0.02	0.01
Bis (2-EH) phthalate	0.01	<0.01	<0.01
Pentachlorophenol	0.03	<0.01	<0.01
Total PCBs	0.03	0.01	<0.01
Waste Unit Group #3			
Arsenic	0.03	0.37	0.08
Copper	0.03	0.52	0.05
Lead	0.01	0.41	0.06
Zinc	0.14	0.14	0.02
Total HPAHs	0.02	<0.01	<0.01
Benzo (a) pyrene	0.01	<0.01	<0.01
Bis (2-EH) phthalate	0.01	<0.01	<0.01
Pentachlorophenol	0.04	<0.01	<0.01
Total PCBs	1.04	0.19	<0.01
Total Dioxins	<0.01	<0.01	<0.01
Waste Unit Group #4			
Antimony	13.96	0.35	0.06
Arsenic	0.09	1.35	0.30
Chromium	44.11	0.19	0.05
Copper	0.04	0.59	0.05
Lead	0.05	1.95	0.30
Zinc	0.81	0.83	0.10
Total HPAHs	0.02	<0.01	<0.01
Benzo (a) pyrene	<0.01	<0.01	<0.01
Bis (2-EH) phthalate	0.01	<0.01	<0.01
Pentachlorophenol	0.05	<0.01	<0.01
Total PCBs	0.02	<0.01	<0.01

Table 6

Ecological Hazard Quotients by Contaminant, Terrestrial Receptors

Operable Unit A

BPA Ross Complex RI

Compound	American Robin (<i>T. migratorius</i>)	Raccoon (<i>P. lotor</i>)	Black tailed Deer (<i>O. columbianus</i>)
Waste Unit Group #5			
Arsenic	0.02	0.25	0.06
Copper	0.07	1.23	0.11
Lead	0.01	0.29	0.05
Zinc	0.10	0.11	0.01
Total HPAHs	0.02	<0.01	<0.01
Benzo (a) pyrene	0.01	<0.01	<0.01
Bis (2-EH) phthalate	0.01	<0.01	<0.01
Pentachlorophenol	0.05	<0.01	<0.01
Total PCBs	0.20	0.04	<0.01
Waste Unit Group #6			
Antimony	3.02	0.07	0.01
Arsenic	0.03	0.44	0.10
Copper	0.02	0.26	0.02
Lead	0.08	2.84	0.44
Zinc	0.13	0.13	0.02
Total HPAHs	0.01	<0.01	<0.01
Benzo (a) pyrene	<0.01	<0.01	<0.01
Bis (2-EH) phthalate	0.01	<0.01	<0.01
Pentachlorophenol	0.05	<0.01	<0.01
Total PCBs	1.81	0.34	<0.01
Waste Unit Group #7			
Arsenic	0.05	0.65	0.15
Chromium	40.04	0.17	0.04
Copper	0.01	0.22	0.02
Lead	0.03	1.11	0.17
Zinc	0.08	0.08	0.01
Total HPAHs	0.01	<0.01	<0.01
Benzo (a) pyrene	<0.01	<0.01	<0.01
Bis (2-EH) phthalate	<0.01	<0.01	<0.01
Pentachlorophenol	0.01	<0.01	<0.01
Total PCBs	0.11	0.02	<0.01

The sole organic contaminant which exceeded one for the ecological RA was total PCBs in Waste Unit Groups 3 and 6. No threshold values were exceeded for the black-tailed deer or raccoon; potential chronic effects could be associated with exposures to the robin only. It should be noted that there are currently few or no undisturbed surface soils in these waste unit groups which could provide suitable habitat for robins.

In summary, ecological risk calculations for surface soil metals indicate the potential for chronic toxicity to indicator species in Waste Unit Group 4 (Sandblast Area). Independent removal actions in accordance with State of Washington Model Toxics Control Act cleanup criteria were conducted in this area as well as in Waste Unit Groups 3, 5, and 7 which eliminate the potential ecological risk identified in these waste unit groups or as in the case of Waste Unit Group 6, provide no suitable habitat now or in the planned future for these species.

An independent removal action was not conducted in the Top Coat Test Area (a component of Waste Unit Group #7); however, potential ecological risks associated with surface soils in this Waste Unit are considered negligible because this area is covered by asphalt pavement and does not provide a suitable habitat for these species now or in the foreseeable future.

8.0 REMEDIATION GOALS

The results of the baseline risk assessment indicate that no further remedial action is necessary under CERCLA in 18 waste units in Operable Unit A and the Ellen Davis Trail.

Three waste units, the Wood Pole Storage Area East, the Ross Substation and Capacitor Yard, and the Capacitor Testing Lab have been identified as requiring further action under CERCLA.

For the Wood Pole Storage Area East, the contaminants of concern are high molecular weight polynuclear aromatic hydrocarbons (HPAHs) and pentachlorophenol. PCBs are the compounds of concern in soils in the Ross Substation & Capacitor Yard and at the Capacitor Testing Lab. Based on consideration of ARARs for this site, the remedial action objectives (RAO or clean up levels) for the compounds of concern are:

Compounds of Concern	RAO Source	Soil Clean up Level (ppm)	Residential Risk at Cleanup Level
Total HPAHs	MTCA Method A residential	1	6.9×10^{-6}
Pentachlorophenol	MTCA Method B residential	8	2.9×10^{-6}
Total PCBs	MTCA Method A industrial residential	10	2.2×10^{-5}
		1	2.2×10^{-6}

The Wood Pole Storage Area East and the Capacitor Testing Lab are considered residential areas

under MTCA since unrestricted access exists and they are not located within a recognized industrial area. Therefore, the residential soil cleanup standards apply to these areas. The Ross Substation and Capacitor Yard is considered industrial under MTCA since it is a secured area within the borders of a recognized industrial area. The industrial soil cleanup standard for PCBs is applicable to this area.

The primary exposure pathway of concern in Operable Unit A is direct dermal contact. Both residential and industrial soil cleanup standards are protective for this pathway, are within EPA's acceptable risk range, and are protective of other media.

Actual or threatened releases of hazardous substances for this site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

9.0 DESCRIPTION OF ALTERNATIVES

Nine alternatives were evaluated for soil remediation at the Capacitor Testing Lab, Wood Pole Storage Area East and the Ross Substation & Capacitor Yard. The general response actions initially considered for soil remediation alternatives for Operable Unit A included:

- Alternative A - No Action,
- Alternative B - Institutional Controls,
- Alternative C - Excavation with Off-Site Disposal,
- Alternative D - Asphalt Capping with Institutional Controls,
- Alternative F - KPEG Dechlorination
- Alternative G - Soil Washing
- Alternative H - BEST® Extraction
- Alternative I - Ex-Situ Solid-Phase Bioremediation, and
- Alternative J - Thermal Treatment with Off-Site Disposal of Residuals.

Each alternative is described briefly in the following sections.

9.1 ALTERNATIVE A: NO ACTION

The No Action alternative is required by the National Contingency Plan (NCP) and serves as a baseline against which other soil remedial alternatives can be compared. Under this alternative, no remedial activities would take place. This alternative does not protect the public health or mitigate unacceptable environmental risks associated with the contamination.

9.2 ALTERNATIVE B: INSTITUTIONAL CONTROLS

This alternative includes the measures to limit or prohibit activities that may interfere with or disturb contaminated areas and includes long-term monitoring of soils. Measures employed as institutional controls would include access restrictions, deed restrictions, and land use restrictions. Access restrictions are designed to prevent unauthorized access to areas where contamination is present and would consist of fencing, signs, and roadway modifications. Deed restrictions would limit future land use. Land use restrictions would prohibit disturbance of soil and nearby buildings.

9.3 ALTERNATIVE C: EXCAVATION WITH OFF-SITE DISPOSAL

This alternative involves the excavation of contaminated soils for disposal at an approved landfill. The excavation would be backfilled with clean earthen fill and compacted.

9.4 ALTERNATIVE D: ASPHALT CAPPING WITH INSTITUTIONAL CONTROLS

This alternative involves the application of a sealed asphalt cap over the contaminated area to reduce potential exposure of humans or the environment to the contaminants. The cap would minimize the leaching of soil contaminants. The asphalt layer would be of sufficient thickness to permit use of the waste unit for multipurpose storage and would have an impermeability rating as required for landfill covers. The asphalt would be sealed to further reduce its permeability and would be appropriately contoured to promote drainage of non-contaminated storm water to the storm sewer. Due to the continued presence of contaminants, institutional controls would be implemented. A long-term inspection program would include regularly scheduled visual examination of the cap surface by qualified personnel. Subsidence, buckling, or cracking would trigger maintenance measures. The results of the risk assessment indicated that contamination migration to air was insignificant. Capping would eliminate dermal contact.

9.5 ALTERNATIVE F: KPEG (POTASSIUM POLYETHYLENE GLYCOL) DECHLORINATION

The KPEG (potassium polyethylene glycol) dechlorination process utilizes potassium or other alkali metal polyethylene glycolates to degrade chlorinated organics. Excavated contaminated soil is mixed with the KPEG solution in a heated reactor. When the reaction is complete, the KPEG solution and water is decanted and the soil is washed with water. The KPEG solution and water are recycled back into the process. KPEG dechlorination reduces the toxicity of chlorinated contaminants and results in a nontoxic byproduct (EPA, 1989).

After treatment, the soil can be used as clean fill on site. Other treatment residuals will be handled properly as hazardous waste, as needed. These residuals will be disposed of according to the specific requirements for each waste stream.

9.6 ALTERNATIVE G: SOIL WASHING

This alternative involves the use of a washing process to remove contaminants from the soil. Excavated soil is sorted to remove large debris. The soil is then rinsed with the wash solution as the soil is passed over a series of screens. Contaminants are removed in the wash solution or are concentrated in the soil fines. Following washing, the treated soil can be used as earthen fill for on-site grading. The contaminant residual, which may include clays and fines, is sent off site for disposal at an approved RCRA landfill.

9.7 ALTERNATIVE H: BEST® EXTRACTION

Basic Extractive Sludge Treatment (BEST®) is a patented process that uses triethylamine to remove contaminants from the soil. Excavated soil is mixed with the triethylamine, which removes contaminants and water from the soil. The triethylamine is separated from the water and contaminants; it is recycled for reuse in the extraction process. A small amount of concentrated contaminant residual would remain after treatment, requiring disposal off site at an approved RCRA landfill. Treated soil can be used as clean earthen fill on site.

9.8 ALTERNATIVE I: EX-SITU SOLID PHASE BIOREMEDIATION

Contaminated soil is excavated and placed in a treatment cell constructed on site. The treatment cell would contain a lined enclosure equipped with a leachate collection and return system, and adding nutrients, water, supplemental micro-organisms, and oxygen as needed. Treated soil can be used as earthen fill for grading on site.

9.9 ALTERNATIVE J: THERMAL TREATMENT WITH OFF-SITE DISPOSAL

Contaminated soil is excavated and incinerated in a mobile rotary kiln incinerator or fluidized bed incinerator. Residual ash would be tested and if necessary disposed off-site. It is possible, based on the results of the testing, that disposal of residual ash could be on site.

9.10 ALTERNATIVES RETAINED FOR DETAILED EVALUATION

The following alternatives were retained for detailed analysis based on the results of the initial screening.

Wood Pole Storage Area East

- Alternative A - No Action,
- Alternative B - Institutional Controls,
- Alternative C - Excavation with Off-Site Disposal,
- Alternative D - Asphalt Capping with Institutional Controls,
- Alternative I - Ex-Situ Solid-Phase Bioremediation.

Ross Substation & Capacitor Yard

- Alternative A - No Action,
- Alternative B - Institutional Controls,
- Alternative C - Excavation with Off-Site Disposal,
- Alternative F - KPEG Dechlorination,
- Alternative G - Soil Washing,
- Alternative H - BEST® Extraction,
- Alternative J - Thermal Treatment with Off-Site Disposal.

Capacitor Testing Lab

- Alternative A - No Action,
- Alternative B - Institutional Controls,
- Alternative C - Excavation with Off-Site Disposal,
- Alternative F - KPEG Dechlorination,
- Alternative G - Soil Washing,
- Alternative H - BEST® Extraction,
- Alternative J - Thermal Treatment with Off-Site Disposal.

10.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives for each waste unit were compared according to nine criteria as defined and required by the NCP. The nine criteria are subdivided into three categories: (1) threshold criteria which relate directly to statutory findings and must be satisfied by each chosen alternative; (2) primary balancing criteria, which include technical factors; and (3) modifying criteria, which are measures of the acceptability of the alternative to state agencies and the community.

All alternatives must meet the threshold criteria of overall protection of human health and the environment and compliance with ARARs. The chart illustrated in Figure 10 shows the relationship between the screening criteria, the nine evaluation criteria, and the role of the criteria during remedy selection. The following sections present the comparison of alternatives.

Screening Criteria

Nine Evaluation Criteria

Role of Criteria During Remedy Selection

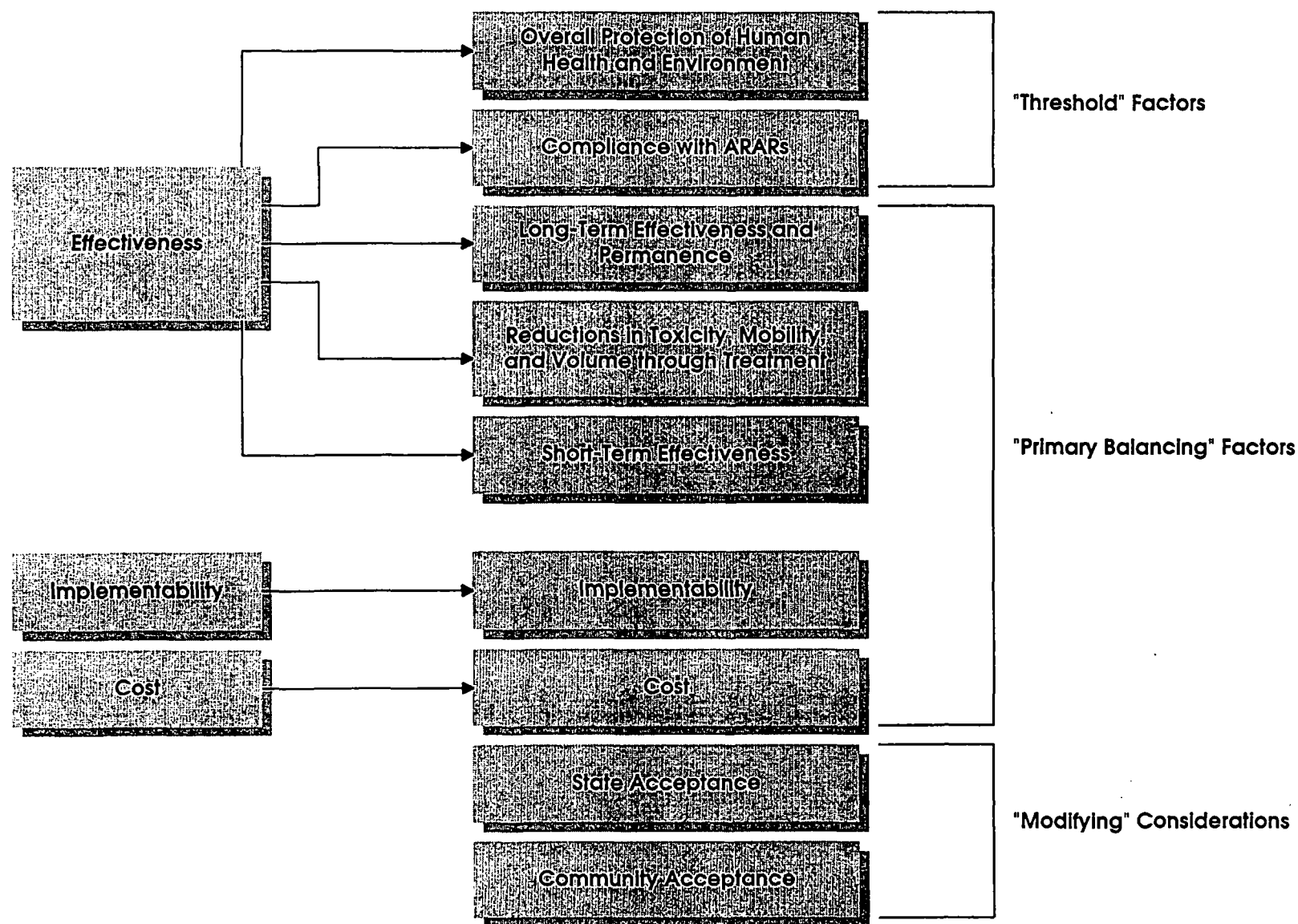


Figure 10
Relationship of Screening Criteria

10.1 COMPARATIVE ANALYSIS FOR WOOD POLE STORAGE AREA EAST

Target Contaminants: HPAHs, PCP

10.1.1 Threshold Criteria

10.1.1.1 Overall Protection of Human Health and the Environment

This criterion measures how the alternative, as a whole, achieves and maintains protection of human health and the environment.

Alternative A, No Action, does not provide protection to human health or the environment and does not prevent the migration of contaminants since no remedial activities would take place to reduce exposures to contaminants.

Alternative B, Institutional Controls, offers a slightly greater level of protection than Alternative A through site restrictions designed to prevent exposure to contaminated material.

Alternative C, Excavation with Off-Site Disposal, offers a higher level of overall protection than Alternatives A or B, through the elimination removal of contaminated materials from the Site. Contaminated materials would be transported to an approved landfill for disposal.

Alternative D, Asphalt Capping with Institutional Controls, offers a level of overall protection slightly higher than Alternative B but lower than Alternative C. Alternative D would not remove risks associated with contamination at the site, but would control risks by preventing exposure to the contaminants, inhibiting future contaminant migration, and providing long-term monitoring.

Alternative I, Ex-Situ Solid-Phase Bioremediation, offers a level of overall protection comparable to Alternative C, but in addition, destroys contaminants to meet regulatory action levels.

10.1.1.2 Compliance with ARARs

Compliance with ARARs is a consideration of how the alternatives comply with other regulations explicitly applicable to the site and with those sufficiently relevant and appropriate to warrant inclusion.

There are no ARARs associated with Alternative A since no remedial actions would be taken, ARARs would not be met. Alternative B will comply with MTCA requirements to prevent contact; however, it does not meet the chemical specific ARARs identified for the site.

All contaminated material would be properly transported and disposed under Alternative C; therefore, ARARs associated with transportation for off-site disposal would be complied with. Alternative D would comply with MTCA requirements for preventing contact and Alternative I would comply with MTCA cleanup requirements for residential land use.

Alternatives C, D, and I would comply with the Southwest Air Pollution Control Agency's (SWAPCA) general standards for maximum air emissions.

Alternatives C, D, and I would comply with ARARs. Alternative A does not satisfy the threshold criteria because "no action" would not be protective, and therefore, will not be further evaluated.

10.1.2 Primary Balancing Criteria

10.1.2.1 Long-Term Effectiveness and Permanence

This criterion evaluates the long-term effectiveness and permanence of alternatives in maintaining protection of human health and the environment after remedial action objectives have been met.

Alternative B, Institutional Controls, controls long-term risks by minimizing the potential for disturbance of contaminated materials. Residual risks to the on-site worker will not represent an unacceptable cancer risk.

Alternative C, Excavation with Off-Site Disposal, has a high degree of long-term effectiveness and permanence. This alternative minimizes the risks associated with contaminated soils by their removal from the Site. Residual risk to the on-site worker will not represent an unacceptable cancer risk.

Alternative D, Asphalt Capping with Institutional Controls, would be slightly more effective than Alternative B but less effective than Alternative C. Under this alternative, contaminants would be left in place and a cap would be installed over them. This cap would prevent exposure to the contamination. The permanence of Alternative D would depend on the effectiveness of institutional controls and on long-term maintenance of the cap. Residual risk to the on-site worker will not represent an unacceptable cancer risk.

Alternative I, Ex-Situ Solid-Phase Bioremediation, offers long-term effectiveness and permanence comparable to Alternative C. Contaminants would be degraded through treatment. Residual risks would be compared to Alternative C.

10.1.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternatives were also evaluated according to their ability to reduce, through treatment, the toxicity, mobility, or volume of contaminants.

There is no treatment associated with Alternatives B, C, or D.

Only Alternative I, Ex-Situ Solid-Phase Bioremediation, provides reduction in contaminant mobility, toxicity, and volume through treatment since contaminants are destroyed.

10.1.2.3 Short-Term Effectiveness

This criterion addresses the effects of the alternative during the construction and implementation phase until remedial action objectives are met.

Alternative B, Institutional Controls, would not present additional short-term risk because contaminated materials would not be disturbed. Site restrictions would be implemented in about two weeks and the deed restrictions and other land use restrictions would take approximately three months to implement.

Alternative C, Excavation with Off-Site Disposal, presents more potential for increased short-term risk to the community, workers, and the environment due to the potential exposure to dust generated during excavation as compared to Alternatives A or B. These risks can be effectively controlled using standard dust suppression methods, personnel protective equipment and through the implementation of a health and safety

plan. These risks will be eliminated after the implementation of the alternative which is expected to require eight weeks. This time frame is longer than Alternative A, but less than Alternative B. Measures to control the risks will be implemented prior to excavation.

Alternative D, Asphalt Capping with Institutional Controls, would present a lower short-term risk than Alternative C. The potential risk would be present only during the spreading of base course materials over the contaminated surface which may generate a potential exposure to dust; however, this risk can be effectively controlled. Time to implement this alternative is similar to Alternative B. It will take approximately two weeks to lay the initial base course thus eliminating the short-term risks. Measures to control the risk will be implemented before commencing the activities associated with laying the base course.

Alternative I, Ex-Situ Solid-Phase Bioremediation, presents a higher level of potential short-term risk to the community, workers and the environment associated with exposure to dust from handling soil during treatment over time as compared to Alternative C. Potential short-term risks can be effectively controlled. With treatment time of approximately one year, the time to complete remediation and reduce short term risks is considerably longer than the other alternatives. Measures to control these risks will be implemented prior to excavating contaminated soil.

10.1.2.4 Implementability

This criterion addresses the technical and administration feasibility of constructing, operating, and maintaining a remedial action alternative.

Alternative B is slightly difficult to implement due to the need for deed restrictions and land-use restrictions.

Alternative C, Excavation with Off-Site Disposal is more difficult to implement than Alternative B because approval for landfill disposal will be required.

Alternative D, Asphalt Capping and Institutional Controls, is more difficult than Alternative B but similar to Alternative C. Labor and equipment for installation of the cap are readily available.

Alternative I, Ex-Situ Solid-Phase Bioremediation, is more difficult to implement than the other alternatives considered. Treatability studies would be necessary to confirm degradation levels. The labor and equipment to perform bioremediation is readily available.

10.1.2.5 Cost

Cost is another criterion by which candidate alternatives are compared. Costs in this case are measured as direct capital costs. The direct capital costs for the remedial alternatives at the Wood Pole Storage Area East for 3,700 cubic yards of contaminated material is as follows:

Alternative	Direct Capital Cost
Alternative B - Institutional Controls	\$20,520
Alternative C - Excavation with Off-Site Disposal ¹	\$513,660
Alternative D - Asphalt Capping with Institutional Controls	\$396,340
Alternative H - Ex-Situ Solid-Phase Bioremediation	
Tier 1: Enhanced Bioremediation	\$450,000
Tier 2: Enhanced Bioremediation, Gravel Cap, Institutional Controls	\$482,120-\$586,520
Tier 3: Enhanced Bioremediation, Asphalt Cap, Institutional Controls	\$510,520-\$870,520

Alternative D, Asphalt Capping with Institutional Controls, is more costly than Alternative B, but significantly less costly than Alternative C.

Alternative I, Ex-Situ Solid-Phase Bioremediation, costs more than the Institutional Controls alternative and costs less than Alternative D.

10.1.3 Modifying Criteria

Modifying criteria are used in the final evaluation of the remedial alternatives, and include comment from Ecology and from the public.

10.1.3.1 State Acceptance

The State of Washington concurs with the selected remedy and comments received from Ecology have been incorporated into this Record of Decision.

10.1.3.2 Community Acceptance

Based on the comments received during the public review period and at the public meeting, the public accepts the preferred alternative.

10.2 ROSS SUBSTATION AND CAPACITOR YARD

Target Contaminant: PCBs

10.2.1 Threshold Criteria

10.2.1.1 Overall Protection of Human Health and the Environment

Alternative A, No Action, does not provide protection to human health or the environment since no

¹Off-site incineration is eliminated from consideration because the contaminated soil was determined not to be a RCRA waste.

remedial activities would take place.

Alternative B, Institutional Controls, offers greater levels of protection as compared to Alternative A, through site restrictions designed to prevent exposure to contaminants.

Alternative C, Excavation and Off-Site Disposal, offers a higher level of protection as compared to A and B because contaminants are removed from the site. The contaminated soil would be treated to meet applicable land disposal requirements.

Alternative F, KPEG Dechlorination, offers a high level of overall protection of human health and the environment, comparable to Alternative C. The KPEG process permanently degrades PCBs and leaves a treatment residual in the soil, but this residual, polyethylene glycol bipheynyl ether is considered to be non-toxic.

Alternative G, Soil Washing, provides a lower level of protection of human health and the environment than Alternatives C and F because Alternative G is not expected to achieve comparable reduction in contaminant levels.

Alternative H, BEST, offers a level of overall protection comparable to Alternatives C and F.

Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, offers the same level of overall protection as Alternative C. The process generates an ash that would be sent to a RCRA landfill for disposal.

10.2.1.2 Compliance with ARARs

There are no ARARs associated with Alternative A. Since no remedial action would be taken, ARARs would not be met. Alternative B will comply with MTCA requirements to prevent contact; however, it does not meet the chemical specific ARARs identified for the site.

All dangerous wastes and treatment residuals that are dangerous wastes would be properly transported and disposed under Alternatives C, F, G, H and J; therefore, ARARs associated with transportation and disposal would be complied with. Alternatives C, F, G, H and J would comply with MTCA clean up requirements for industrial land use.

Alternatives C, F, G, H, and J would meet requirements for disposal of PCBs at chemical waste landfills.

Alternatives C, F, G, H and J would comply with the Southwest Air Pollution Control Agency's (SWAPCA) general standards for maximum air emissions.

Alternatives F and G would comply with the state waste discharge program, since waste water discharges would meet all effluent guidelines.

In summary, Alternative A would not meet ARARs and cannot be selected as the remedial alternative. Alternatives C, D, F, G, H, and J would comply with ARARs. Since Alternative A does not satisfy the threshold criteria of protectiveness, it will not be further evaluated.

10.2.2 Primary Balancing Criteria

10.2.2.1 Long-term Effectiveness

Alternative B, Institutional Controls, is more effective than the No Action alternative. Site restrictions would minimize the potential for disturbance of contaminated soils and long-term monitoring would provide information relating to changes in contaminant concentrations. This alternative will not represent an unacceptable cancer risk to the on-site worker.

Alternative C, Excavation with Off-Site Disposal, has a high degree of long-term effectiveness and permanence. This alternative eliminates the risks associated with contaminated soils by excavating and transporting soils off site to a TSCA landfill. Residual risks to the on-site worker will not represent an unacceptable cancer risk.

Alternative F, KPEG Dechlorination, has a comparable level of long-term effectiveness and permanence to Alternative C. The risks associated with contaminants are reduced by permanent degradation. Residual risks to the on-site worker will not represent an unacceptable cancer risk.

Alternative G, Soil Washing, provides a lower level of long-term effectiveness and permanence than Alternatives C and F. Alternative G requires the addition of institutional controls to manage the residual risks. This is required because soil washing is not expected to reduce the contaminant levels below industrial soil clean up levels. Residual risks to the on-site worker will not represent an unacceptable cancer risk.

Alternative H, BEST®, would provide long-term effectiveness and permanence comparable to Alternatives C and F. Alternative H minimizes the risks associated with on-site contamination through removal and treatment of contaminated soils. Residual risks to the on-site worker will not represent an unacceptable cancer risk.

The long-term effectiveness and permanence of Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, would be similar to that of Alternatives C, F and H. Alternative J would minimize the risks associated with contaminated soils through removal and incineration of contaminated material. If necessary, the residual from the incinerator would be placed in a TSCA-approved landfill.

10.2.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative B, Institutional Controls, and Alternative C, Excavation with Off-Site Disposal, would not involve treatment of the contaminated materials, so no reduction in mobility, toxicity, or volume would be achieved using these alternatives.

Alternative F, KPEG Dechlorination, offers a level of reduction of mobility, toxicity, and volume through treatment of on-site contaminants. Since the contaminants are degraded to non-toxic compounds, this alternative provides a higher level of mobility, toxicity, and volume reduction overall on site.

Alternative G, Soil Washing, offers a lower level of reduction of mobility, toxicity, and volume through treatment than F. This alternative is not expected to achieve the cleanup standards, therefore institutional controls must be implemented.

Alternative H, BEST, offers a level of mobility, toxicity, and volume reduction comparable to Alternatives C and F. The process generates a concentrated liquid containing the contaminants removed from

the soil, which would be sent off site for incineration.

Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, offers the same level of mobility, toxicity, and volume reduction as Alternatives C, F and H. The contaminated soil is incinerated, thus destroying the contaminants. The ash generated by thermal treatment would be sent to a RCRA landfill for disposal.

10.2.2.3 Short-Term Effectiveness

Alternative B, Institutional Controls, is comparable to Alternative A and would not result in added short-term risk. It would take approximately one week for installation of site restrictions and about three months to implement deed restrictions and land-use restrictions.

Alternative C, Excavation with Off-Site Disposal, may involve short-term risk to on-site workers, the community, and the environment from exposure to dust generated during the excavation of soil as compared to Alternatives A and B. These risks can be effectively controlled using standard dust suppression methods, personnel protective equipment and through the implementation of a health and safety plan. These risks will be eliminated after the implementation of the alternative which is dependent on scheduling shutdowns of the Ross Substation & Capacitor Yard. Each shutdown would last one week with four shutdowns required to complete the excavation. This alternative would take longer to implement than alternative A or B. Measures to control risks would be in place prior to excavation.

Alternative F, KPEG Dechlorination, presents a slightly higher level of potential short-term risk than Alternative C, due to handling of contaminated soil for treatment. Short-term risks can be effectively minimized by the use of appropriate controls, but would be present until the full implementation of the alternative. This alternative would take approximately 12 weeks longer than Alternative C. Measures to control risks would be in place prior to excavation.

Alternative G, Soil Washing, presents a slightly higher level of potential risk as compared to Alternative F. Potential risk may be increased from exposure to dust during handling of soil after treatment. Short-term risks can be effectively controlled. Short-term risk will be present until the alternative is fully implemented, which will take 12 weeks longer than Alternative C. Measures to control risks would be in place prior to excavation.

Alternative H, BEST® Extraction, is comparable to Alternative F in short-term effectiveness. Although there would be potential increased risks to the community, workers, and the environment during excavation and treatment due to exposure to dust, these could be effectively controlled. Like KPEG, this alternative takes approximately 12 weeks to complete soil treatment after excavation. Short-term risks will be eliminated after complete implementation of the alternative. Measures to control risks would be in place prior to excavation.

The short-term effectiveness of Alternative J, Thermal Treatment with Off-Site Residual Disposal, would be similar to that of Alternatives F and H. Potential increased risks to the community, workers, and the environment during excavation and handling can be effectively controlled by using appropriate measures. Risk associated with the treatment process would be minimal because incineration offers high destruction rates and is subject to stringent emission control standards. This alternative would take 18 weeks longer than Alternative C to implement. Short-term risks would be completely removed after implementation. Measures to control risks would be in place prior to the start of excavation.

10.2.2.4 Implementability

Alternative B is slightly difficult to implement due to the need for deed and land-use restrictions.

Alternative C is more difficult to implement than Alternative B. This waste unit is actively used for power distribution and therefore, scheduling activities within this area is limited due to operational constraints. BPA has excavated and disposed of contaminated soils from a number of similar sites. BPA has a trained work force, standardized procedures and the necessary equipment readily available to implement this alternative.

Alternative F is more difficult to implement than Alternative B. This alternative has the same limitations as Alternative C, plus there is the need for treatability studies.

Alternative G may be more difficult than Alternative F due to the need for long-term institutional controls. These institutional controls are required to manage the long-term risks, since this alternative is not expected to achieve the cleanup standards.

Alternative H is comparable to Alternative F. Treatability studies would be necessary and advance scheduling would be required to mobilize the BEST® processing equipment.

Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, is more difficult to implement than Alternatives F and H. Advance scheduling of incineration equipment would be necessary and a test burn must be conducted. Off-gas from the incinerator would require treatment or monitoring to ensure compliance with air pollution standards.

10.2.2.5 Cost

The estimated cost of each soil cleanup alternative, based on the direct capital costs for remediating 1,196 cubic yards of contaminated material in the Ross Substation and Capacitor Yard follows:

Alternative	Direct Capital Cost
Alternative B - Institutional Controls	\$0
Alternative C - Excavation with Off-Site Disposal	\$447,380
Alternative F - KPEG Dechlorination	\$559,030
Alternative G - Soil Washing	\$485,580
Alternative H - BEST Extraction	\$650,180
Alternative J - Thermal Treatment with Off-Site Disposal of Residuals	\$812,630

Alternative B has the lowest cost of all the other alternatives exclusive of the No Action alternative.

Costs for Alternatives C, F, G and H are comparable. Alternatives C and H includes long-term institutional controls required for remediation to industrial cleanup levels.

Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, has the highest overall cost.

10.2.3 Modifying Criteria

10.2.3.1 State Acceptance

The State concurs with the selected remedy and comments received from Ecology have been incorporated into this Record of Decision.

10.2.3.2 Community Acceptance

Based on the comments received during the public review period and at the public meeting, the public accepts the proposed alternative.

10.3 CAPACITOR TESTING LAB

Target Contaminant: PCBs

10.3.1 Threshold Criteria

10.3.1.1 Overall Protection of Human Health and the Environment

Alternative A, No Action, does not provide protection to human health or the environment since no remedial activities would take place.

Alternative B, Institutional Controls, offers greater levels of protection as compared to Alternative A, through site restrictions designed to prevent exposure to contaminants.

Alternative C, Excavation and Off-Site Disposal, offers a higher level of protection as compared to A and B because contaminants are removed from the site.

Alternative F, KPEG Dechlorination, offers a high level of overall protection of human health and the environment, comparable to Alternative C. The KPEG process permanently degrades PCBs and leaves a treatment residual in the soil, but this residual, polyethylene glycol bipheynyl ether is considered to be non-toxic.

Alternative G, Soil Washing, provides a lower level of protection of human health and the environment than Alternatives C and F because Alternative G is not expected to achieve comparable reduction in contaminant levels.

Alternative H, BEST, offers a level of overall protection comparable to Alternatives C and F.

Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, offers the same level of overall protection as Alternative C, F, and H. The process generates an ash that would be sent to a RCRA landfill for disposal.

10.3.1.2 Compliance with ARARs

There are no ARARs associated with Alternative A since no remedial action would be taken. ARARs would not be met. Alternative B will comply with MTCA requirements to prevent contact; however, it does not meet the chemical specific ARARs identified for the site.

All dangerous wastes and treatment residuals that are dangerous wastes would be properly transported and disposed under Alternatives C, F, G, H and J; therefore, ARARs associated with transportation and disposal would be complied with. Alternatives C, F, G, H and J would comply with MTCA clean up requirements for residential land use.

Alternatives C, F, G, H, and J would meet requirements for disposal of PCBs at chemical waste landfills. Alternative J would meet requirements for PCB incineration units.

Alternatives C, F, G, H and J would comply with the Southwest Air Pollution Control Agency's (SWAPCA) general standards for maximum air emissions.

Alternatives F and G would comply with the state waste discharge program, since waste water discharges would meet all effluent guidelines.

Alternatives C, F, G, H, and J would comply with ARARs. Since Alternative A does not satisfy the threshold criteria of protectiveness it will not be further evaluated.

10.3.2 Primary Balancing Criteria

10.3.2.1 Long-term Effectiveness

Alternative B, Institutional Controls, is more effective than the No Action alternative. Site restrictions would minimize the potential for disturbance of contaminated soils and long-term monitoring would provide information relating to changes in contaminant concentrations. Residual risks to the on-site worker would not represent an unacceptable cancer risk.

Alternative C, Excavation with Off-Site Disposal, has a high degree of long-term effectiveness and permanence. This alternative eliminates the risks associated with contaminated soils by excavating and transporting soils off site to a TSCA landfill. Residual risks to the on-site worker would not represent an unacceptable cancer risk.

Alternative F, KPEG Dechlorination, has a comparable level of long-term effectiveness and permanence to Alternative C. Residual risks to the on-site worker would not represent an unacceptable cancer risk.

Alternative G, Soil Washing, provides a lower level of long-term effectiveness and permanence than Alternatives C and F. Alternative G requires the addition of institutional controls to manage the residual risks. This is required because soil washing is not expected to reduce the contaminant levels below residential soil clean up levels. Residual risks to the on-site worker would not represent an unacceptable cancer risk.

Alternative H, BEST®, would provide long-term effectiveness and permanence comparable to Alternatives C and F. Alternative H minimizes the risks associated with on-site contamination through removal and treatment of contaminated soils. Residual risks to the on-site worker would not represent an

unacceptable cancer risk.

The long-term effectiveness and permanence of Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, would be similar to that of Alternatives C, F and H. Alternative J would minimize the risks associated with contaminated soils through removal and incineration of contaminated material. If necessary, the residual from the incinerator would be placed in a TSCA-approved landfill.

10.3.2.2 Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative B, Institutional Controls, and Alternative C, Excavation, would not involve treatment of the contaminated materials, so no reduction in mobility, toxicity, or volume would be achieved using these alternatives.

Alternative F, KPEG Dechlorination, offers a level of reduction of mobility, toxicity, and volume through treatment of on-site contaminants. Since the contaminants are degraded to non-toxic compounds, this alternative provides a higher level of mobility, toxicity, and volume reduction overall on site.

Alternative G, Soil Washing, offers a lower level of reduction of mobility, toxicity, and volume through treatment than F. This alternative is not expected to achieve the residential cleanup standards, therefore institutional controls must be implemented.

Alternative H, BEST, offers a level of mobility, toxicity, and volume reduction comparable to Alternatives C and F. The process generates a concentrated liquid containing the contaminants removed from the soil, which would be sent off site for incineration.

Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, offers the same level of mobility, toxicity, and volume reduction as Alternatives C, F and H. The contaminated soil is incinerated, thus destroying the contaminants. The ash generated by thermal treatment would be sent to a RCRA landfill for disposal.

10.3.2.3 Short-Term Effectiveness

Alternative B, Institutional Controls would not result in added short-term risk. It would take approximately one week for installation of site restrictions and about three months to implement deed restrictions and land-use restrictions.

Alternative C, Excavation with Off-Site Disposal, may involve short-term risk to on-site workers, the community, and the environment from exposure to dust generated during the excavation of soil as compared to Alternatives A and B. These risks can be effectively controlled using standard dust suppression methods, personnel protective equipment and through the implementation of a health and safety plan. These risks will be eliminated after the implementation of the alternative. This alternative would take longer to implement than alternative A or B. Measures to control risks would be in place prior to excavation.

Alternative F, KPEG Dechlorination, presents a slightly higher level of potential short-term risk than Alternative C, due to handling of contaminated soil for treatment. Short-term risks can be effectively minimized by the use of appropriate controls, but would be present until the full implementation of the alternative. This alternative would take approximately 12 weeks longer than Alternative C. Measures to control risks would be in place prior to excavation.

Alternative G, Soil Washing, presents a slightly higher level of potential risk as compared to Alternative F. Potential risk may be increased during exposure to dust during handling of soil after treatment. Short-term risks can be effectively controlled. Short-term risk will be present until the alternative is fully implemented, which will take 12 weeks longer than Alternative C. Measures to control risks would be in place prior to excavation.

Alternative H, BEST® Extraction, is comparable to Alternative F in short-term effectiveness. Although there would be potential increased risks to the community, workers, and the environment during excavation and treatment due to exposure to dust, these could be effectively controlled. Like KPEG, this alternative takes approximately 12 weeks to complete soil treatment after excavation. Short-term risks will be eliminated after complete implementation of the alternative. Measures to control risks would be in place prior to excavation.

The short-term effectiveness of Alternative J, Thermal Treatment with Off-Site Residual Disposal, would be similar to that of Alternatives F and H. Potential increased risks to the community, workers, and the environment during excavation and handling can be effectively controlled by using appropriate measures. Risk associated with the treatment process would be minimal because incineration offers high destruction rates and is subject to stringent emission control standards. This alternative would take 18 weeks longer than Alternative C to implement. Short-term risks would be completely removed after implementation. Measures to control risks would be in place prior to the start of excavation.

10.3.2.4 Implementability

Alternative B would be not be difficult to implement.

Alternative C is more difficult to implement than Alternative B. This waste unit is actively used for power distribution and therefore, scheduling activities within this area is limited due to operational constraints. BPA has excavated and disposed of contaminated soils from a number of similar sites. BPA has a trained work force, standardized procedures and the necessary equipment readily available to implement this alternative.

Alternative F is more difficult to implement than Alternative B. This alternative has the same limitations as Alternative C, plus there is the need for treatability studies.

Alternative G may be more difficult than Alternative F due to the need for long-term institutional controls. These institutional controls are required to manage the long-term risks, since this alternative is not expected to achieve the residential cleanup standards.

Alternative H is comparable to Alternative F. Treatability studies would be necessary and advance scheduling would be required to mobilize the BEST® processing equipment.

Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, is more difficult to implement than Alternatives F and H. Advance scheduling of incineration equipment would be necessary and a test burn must be conducted. Off-gas from the incinerator would require treatment or monitoring to ensure compliance with air pollution standards.

10.3.2.5 Cost

The estimated cost of each soil cleanup alternative, based on the present worth of the initial capital

cost and the long-term operating and maintenance costs for remediating 68 cubic yards of contaminated material in the Capacitor Testing Lab follows:

Alternative	Direct Capital Cost
Alternative B - Institutional Controls	\$2,800
Alternative C - Excavation with Off-Site Disposal	\$35,560
Alternative F - KPEG Dechlorination	\$108,050
Alternative G - Soil Washing	\$70,120
Alternative H - BEST Extraction	\$95,900
Alternative J - Thermal Treatment with Off-Site Disposal of Residuals	\$100,300

Alternative B has the lowest cost of all the other alternatives.

Costs for Alternatives C, F, G and H are comparable. Alternatives C and H includes long-term institutional controls required for remediation to industrial cleanup levels.

Alternative J, Thermal Treatment with Off-Site Disposal of Residuals, has the highest overall cost.

10.3.3 Modifying Criteria

10.3.3.1 State Acceptance

The State concurs with the selected remedy and comments received from Ecology have been incorporated into this Record of Decision.

10.3.3.2 Community Acceptance

Based on the comments received during the public review period and at the public meeting, the public accepts the proposed alternative.

11.0 SELECTED REMEDY

11.1 KEY ELEMENTS OF SELECTED REMEDY FOR WOOD POLE STORAGE AREA EAST

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine criteria, and public comments, the most appropriate remedy for the Wood Pole Storage Area East is Alternative I, Ex-Situ Solid-Phase Bioremediation with enhancements. The contaminants of concern in the Wood Pole Storage Area East are HPAHs and pentachlorophenol. The soil cleanup levels for these compounds are 1 ppm and 8 ppm, respectively. The estimated volume of contamination is 3,700 cubic yards.

This alternative is preferred because it best achieves the goals of the evaluation criteria in comparison to other alternatives. This alternative was selected because it employs an innovative technology. It provides

on-site treatment with permanent reduction in the toxicity, mobility and volume of the soil contamination and reduces contaminants to levels that are protective of human health and the environment.

The selected remedy would be implemented as follows:

- A treatability study would be performed on samples of contaminated soil to design the treatment regimen and refine treatment time estimates. The treatability study needs to determine the treatment cell size, depth, microbes and oxygen concentrations. Area required will depend on the number of lifts of treatment which is directly related to the time required to complete remediation as determined by the treatability studies.
- Contaminated soil is excavated and placed in an aboveground treatment cell.
- If a biotreatment cell is constructed, it would consist of an earthen bermed area lined with polyethylene and layered with six inches of sand. Runon controls will consist of berms to divert water around rather than through the treatment cell. Runoff controls will consist of berms to divert water to one or more sumps. Water is collected in these sumps and pumped to a nearby storage tank. Water in the tank will be reapplied to the soil treatment area as required to maintain soil moisture content within prescribed limits. It may be treated and discharged to the sanitary sewer, pending permits.
- Soils which exceed the residential soil clean up standard for total carcinogenic HPAH of 1.0 mg/kg (MTCA Method A) or for pentachlorophenol of 8 mg/kg (MTCA Method B) will be excavated and treated.
- The soil is treated with nutrients, and any necessary additives as determined by the treatability studies. A leachate system is used to irrigate the soil in the treatment cell. Oxygen required to maintain aerobic conditions can be supplied by adding hydrogen peroxide to the irrigation water, through forced air piping, or by tilling the soil. To further ensure that the contaminants are reduced to the lowest possible levels, an ethanol/water solution will be used to enhance bioremediation of organic compounds in the soil. The ethanol solution is used to ensure the release of organic chemical from the soil to provide a nutrient source for the microorganisms. In addition to this enhancement, ultraviolet lights will be used to aid in the degradation of the organic compounds of concern. Wave lengths have been chosen to provide the maximum degradation potential for the chemicals.
- Soil samples are collected from the treatment cell for chemical and biological monitoring of soil conditions in accordance with the treatment and monitoring schedule.
- Confirmatory soil sampling of the excavation is performed to ensure that all soil which exceeds residential soil clean up levels has been removed.
- After the remediation is complete the treatment cell will be dismantled and scrapped. If after treatment the chemical residual levels in the soil exceed the primary cleanup goal of 1 ppm (HPAHs) and 8 ppm (pentachlorophenol), the soil will be returned to the storage yard and a determination will be made as to which type of cap should be implemented to contain the remaining contamination as shown in Table 7.

Table 7

Preferred Alternative Tier
Wood Pole Storage Area East
Operable Unit A ROD
BPA Ross Complex

Preferred Alternative Tier	Primary Cleanup Goal ¹		Capital Cost
	HPAH	PCP	
Tier 1: Enhanced Bioremediation	1 ppm	8 ppm	\$450,000
Tier 2: Enhanced Bioremediation with Installation of Gravel Barrier on Soil and Institutional Controls	1 - 23 ppm	8 - 126 ppm	\$482,120 to \$586,520 ²
Tier 3: Enhanced Bioremediation with CAP Installation on Soil and Institutional Controls	> 23 ppm	> 126 ppm	\$510,520 to \$870,520 ³

- ¹ - The cleanup level for HPAHs, 1 ppm, is the remedial action objective and 23 ppm is the 1×10^{-4} risk level for the on-site worker. The clean up level for PCP, 8 ppm, is the remedial action objective and 126 ppm represents a 1×10^{-4} risk level for the on-site worker.
- ² - Cost range is based on a six inch gravel cap covering 10% to 100% of the Wood Pole Storage Area and \$20,520 for institutional controls.
- ³ - Cost range is based on a four inch asphalt cap covering 10% to 100% of the Wood Pole Storage Area and \$20,520 for institutional controls.

Laboratory testing will be undertaken throughout the course of the bioremediation project to monitor contaminant levels in the treated soils. Progress of enhanced bioremediation toward the targeted remediation goals will be assessed at the end of the first summer session (approximately four months). If after four months, contaminant concentrations are continuing to exhibit a reduction in concentration, bioremediation will continue. However, if contaminant concentrations over time represent static conditions which suggest a treatability limitation, a determination will be made to select a tiered preferred alternative as shown in Table 10. The tiered alternatives are based on the technical ability of bioremediation to achieve the soil cleanup levels of 1 ppm for HPAH and 8 ppm for PCP. The rationale for the tiered approach allows for flexibility in using an innovative treatment technology succeeded by optional alternatives to achieve the soil cleanup standards that will be protective of human health and the environment and be cost-effective. If the Tier 1 cleanup levels can not be achieved using enhanced bioremediation, then either Tier 2 or Tier 3 will be selected as the optional preferred alternative. The selection of either Tier 2 or 3 will be based on the achievable soil cleanup levels for HPAHs and PCBs. Tier 2 involves the installation of a gravel barrier on the soil with institutional controls. Tier 3 involves the installation of an asphalt cap with institutional controls. Table 10 presents the capital costs related to each tier.

11.2 KEY ELEMENTS OF SELECTED REMEDY FOR ROSS SUBSTATION & CAPACITOR YARD

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine criteria, and public comments, the selected remedy for the Ross Substation & Capacitor Yard is Alternative C, Excavation with Off-Site Disposal. The compound of concern in the Ross Substation and Capacitor Yard soils is PCBs and the industrial soil clean up level is 10 ppm. The estimated volume of contamination is 1,196 cubic yards.

This alternative is preferred because it best meets the evaluation criteria as compared to the other alternatives. It can be readily implemented and is protective of human health and the environment. The risks posed by the contaminated soil would be addressed by removal of the soil from the Site.

The selected remedy would be implemented as follows:

- The Ross Substation & Capacitor Yard is scheduled for sequenced shutdowns in sections, to facilitate ongoing power distribution.
- Contaminated soil is excavated, tested and hauled to a TSCA-approved landfill.
- Soil sampling and testing is performed in each excavation to confirm that the cleanup standards have been achieved. Clean fill will then be placed in the excavation.
- Because the area is fenced and isolated from any nearby residential areas and likely to remain an industrial site, cleanup will be to industrial standards. In accordance with MTCA Method A requirements for industrial areas, fencing and deed restrictions will be maintained after cleanup.

11.3 KEY ELEMENTS OF SELECTED REMEDY FOR THE CAPACITOR TESTING LAB

Based upon consideration of the requirements of CERCLA, the detailed analysis of the alternatives using the nine criteria and public comments, the selected remedy for the Capacitor Testing Lab is Alternative C, Excavation with Off-Site Disposal. The compound of concern in the Capacitor Testing Lab is PCBs and the soil cleanup level is 1 ppm. The estimated volume of contaminated soil is 68 cubic yards.

This alternative is preferred because it best meets the evaluation criteria as compared to the other alternatives. It can be readily implemented and is protective of human health and the environment. The risks posed by the contaminated soil would be addressed by removal of the soil from the Site.

The selected remedy would be implemented as follows:

- Contaminated soil is excavated, tested and hauled to a TSCA-approved landfill. The estimated volume of soil to be removed was 68 cubic yards.
- Soil sampling and testing is performed in each excavation to confirm that the cleanup standards have been achieved. Clean fill will then be placed in the excavation.
- Cleanup of PCB contaminated soils will be to residential standards.

12.0 STATUTORY DETERMINATION

BPA and EPA's primary responsibility under CERCLA, is to ensure that the selected remedy will protect human health and the environment. Additionally, Section 121 of CERCLA, as amended by SARA, establishes several other statutory requirements and preferences. These specify that, when complete, the selected remedy must comply with applicable and relevant or appropriate environmental standards established under federal and state environmental laws unless a waiver is justified.

The selected remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The remedy should represent the best balance of tradeoffs among the alternatives with respect to pertinent criteria. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element.

The selected remedies for the contaminated soil at the Wood Pole Storage Area East and the Ross Substation and Capacitor Yard and the Capacitor Testing Lab meet the statutory requirements.

12.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy will protect human health and the environment through removing contaminants from the site and destroying contaminants until the remaining levels are protective of human health and the environment. PCBs in soils will be removed from the Ross Substation and Capacitor Yard and disposed off-site. Contaminants, HPAHs and pentachlorophenol, in the Wood Pole Storage Area East will be degraded through a bioremediation process. Engineering controls will be utilized during excavation and bioremediation to eliminate the potential for exposure to dust. Sampling and analysis will be conducted following excavation and during the bioremediation process to ensure that contaminant levels are either removed or are below levels that are protective of human health and the environment. There will be no adverse effects on human health and the environment caused by construction and implementation of the selected remedies.

12.2 COMPLIANCE WITH ARARs

The selected remedy of excavation and off-site disposal in the Ross Substation and Capacitor Yard and the Capacitor Testing Lab and bioremediation in the Wood Pole Storage Area East will comply with the

ARARs presented in the following list.

- Requirements of Washington Model Toxics Control Act (Initiative 97) for clean up of hazardous waste sites, Chapter 70.105 RCW, as codified in Chapter 173-340 WAC.
- General emission standards under WAC 173-400-040 for visible emissions, fugitive emissions and emissions of air contaminants which are detrimental to persons or property;
- Ambient source impact levels established under WAC 173-460-070 for new sources of toxic air pollutants, including sites subject to the Model Toxics Control Act;
- Performance requirements under WAC 173-460-040, WAC 173-460-060 and Section 400-100 of the General Regulations for Air Pollution Sources of the Southwest Air Pollution Control Authority.
- Federal hazardous waste transportation regulations, Title 49 CFR Parts 171 and 172.

12.2.4 Other Criteria, Advisories, or Guidance To-Be-Considered (TBC)

PCB cleanup levels are consistent with 40 CFR Part 761, Subpart G, Spill Cleanup Policy Rule. In addition, off-site disposal of contaminated soil will be at a chemical waste landfill operating in accordance with 40 CFR Part 761 Subpart D (which is not an ARAR because it is not on-site), and in accordance with the revised Procedures for Planning and Implementing Off-Site Response Actions, OSWER Directive 9834.11, November 13, 1987, 9834.11a, January 4, 1988. No other criteria, advisory, or guidance are considered necessary for implementation of the selected remedy.

12.3 COST EFFECTIVENESS

The selected remedies are the most cost effective alternative because they protect human health and the environment, attain ARARs, and meet the objectives established for the remedial action in a way that is proportional to their costs.

The selected remedy for the Woodpole Storage Area East was in the same cost range as the other alternatives evaluated; however, the remedy selected is the most compatible alternative with BPA's future land use of this area and the innovative treatment technology is expected to be implementable.

The remedy for the Ross Substation and Capacitor Yard and the Capacitor Testing Lab is readily implementable at a lower cost than any other options and provides protection to human health and the environment.

12.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at the BPA Ross Complex. The selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, volume achieved through treatment, short-term effectiveness, , and cost. The remedy in the Wood Pole Storage Area East employs an alternative treatment technology that will result in a permanent remedy.

12.5 PREFERENCE FOR TREATMENT AS PRINCIPAL ELEMENT

The Ex-Situ Solid Phase Bioremediation satisfies the statutory preference for treatment that permanently and significantly reduces the toxicity, mobility, and volume of hazardous substances. Contaminants will be destroyed to the maximum extent practicable.

13.0 DOCUMENTATION OF SIGNIFICANT CHANGES

There are three significant changes pertaining to OUA since the Proposed Plan was released for public comment in August, 1992:

(1) The Proposed Plan identified the need for remedial action under CERCLA at the Wood Pole Storage Area East and at the Ross Substation and Capacitor Yard. However, it was clearly stated that the Washington Department of Ecology disagreed with EPA's position and supported the need for remedial action at the Capacitor Testing Lab as well. It was also stated that BPA had agreed to pursue soil cleanup as a removal action at the Capacitor Testing Lab as described in the Feasibility Study.

Since the release of the Proposed plan, EPA has reevaluated the data and the risk assessment for the Capacitor Testing Lab. EPA has concluded that there is not a sufficient difference between the risks at the Ross Substation and Capacitor Yard and the Capacitor Testing Lab to warrant action at one area and not the other. Therefore, EPA has agreed to include the Capacitor Testing Lab for remedial action under CERCLA as part of the OUA ROD.

Although the alternatives for remedial action at the Capacitor Testing Lab were not presented in the Proposed Plan, the Capacitor Testing Lab was evaluated as part of the Feasibility Study. Thus, the detailed analysis of alternatives and cost comparisons have been available for public review and are a part of the Administrative Record. The contaminant of concern, cleanup standards and remedial action for this area are identical to the Ross Substation and Capacitor Yard. The Capacitor Testing Lab has been part of the RI/FS process and selection of a remedial action for this waste area is considered a logical outgrowth of the information already available to the public. Therefore, EPA determined that the Proposed Plan did not have to be amended because it is consistent with the type of remediation that has been presented for public comment.

(2) The Proposed Plan specified bioremediation as the preferred treatment alternative for the Wood Pole Storage Area East. BPA has determined that "enhanced bioremediation" which utilizes geochemical enhancements (UV light and chemical oxidizers) in addition to conventional microbial activity would have a greater assurance of achieving the cleanup standards. In addition, the overall estimated cost of the enhanced bioremediation is less than half the cost that was estimated in the Proposed Plan. The selected remedy includes a contingency that provides for alternative clean up levels if the clean up standards cannot be achieved. If that is the case, after treatment is completed, the remedy includes on-site disposal with capping. Depending on the level of contamination remaining in soils, one of the two types of caps specified in Section 10 will be implemented.

(3) The Proposed Plan specified the volume of contamination in the Ross Substation and Capacitor Yard as 4,900 cubic yards. This volume was overestimated and the correct volume is 1,196 cubic yards.

ATTACHMENT I
RESPONSIVENESS SUMMARY

**RESPONSIVENESS SUMMARY
OPERABLE UNIT A
BONNEVILLE POWER ADMINISTRATION
ROSS COMPLEX**

This responsiveness summary addresses the questions and comments received by the Bonneville Power Administration concerning the Proposed Plan related to soil remediation for Operable Unit A at the Ross Complex located in Vancouver, Washington. The Site was listed on the National Priorities List (NPL) in November 1989 based on the presence of volatile organics compounds in groundwater and the Site's proximity to the City of Vancouver's drinking water supply. As a results of the listing BPA, pursuant to a Federal Facility Agreement signed by BPA, EPA, and the Washington Department of Ecology (Ecology) on May 1, 1990, BPA conducted a Remedial Investigation/Feasibility Study (RI/FS) to determine the nature and extent of contamination at the site and to evaluate alternatives for the clean up of contaminated areas.

On May 1, 1991, a community relations plan (CRP) was prepared by BPA's Community Relations Group in accordance with CERCLA, as amended by SARA. The CRP included establishing information repositories and communication pathways to disseminate information. Information repositories are located at both the Ross Complex and in the Vancouver Regional Library, 1007 East Mill Plane Boulevard, Vancouver, Washington 98663.

An administrative record was established to provide the basis for selection of the remedial action in accordance with section 113 of CERCLA. The administrative record is available for public review at the Ross Complex or the Vancouver Regional Library. During the RI/FS, BPA issued a press release and five additional fact sheets. The chronology of the community relations is listed below.

- May 22, 1990 A scoping meeting was held to provide information to the public and hear concerns about environmental conditions at the site.
- July 1990 Fact sheet No. 4 described the results of the May scoping meeting.
- March 1991 Fact sheet No. 5 described chronology of events and the work plan for the RI/FS.
- May 1991 Fact sheet No. 6 described the RI and FS programs and current site work.
- August 1991 Fact sheet No. 7 described status of the RI field work.
- May 1992 Fact sheet No. 8 defined Operable Units A and B, discussed OUA RI and risk assessment findings, and activities planned for the summer of 1992.

The public was given the opportunity to participate in the remedy selection process in accordance with sections 117 and 113(k)(2)(B) of CERCLA. The proposed plan for Operable Unit A, which summarized the alternatives evaluated and presented the preferred alternative, was mailed to approximately 800 interested parties on August 14, 1992. BPA provided public notice through a display ad in the Columbian and Oregonian on August 24, 1992 to explain the proposed plan, list the public comment period, and announce the public meeting. Press coverage was also provided in the local news media which resulted in a news article of August 20, 1992.

A 30-day public comment period was held from August 14 to September 14, 1992. Approximately 20 people attended a public meeting, which was held on September 2, 1992 at the Ross Complex, DOB Auditorium. The public comment period was held from August 14 through September 14, 1992. BPA held a public meeting on Wednesday, September 2, 1992 to explain the recommended cleanup plan and solicit public comments. Four written comments were received during the comment period. Copies of the transcripts for the public meetings and comment letters received are provided in the Administrative Record. A summary of the comments received followed by BPA's response follows.

Groundwater concerns that were expressed during the public comment period on the Proposed Plan for the cleanup of contaminated soils at the site will be addressed in the separate Record of Decision that documents the cleanup decision for the contaminated groundwater at the site. A Proposed Plan for Operable Unit B, which describes Site groundwater concerns, will be available for public review in June 1993 and the Record of Decision is scheduled for release in August 1993.

1. **It is imperative that the public know what goes on at the facility and that the remedies selected will be safe and will be implemented in a timely manner.**

Response: Since 1985 BPA has endeavored to keep the public informed about events related to the hazardous waste investigation at Ross. We have done this by working with the media and through a series of written notices, information sheets, and public meetings. We will continue to look for ways to improve communication with our public.

As stated at the public meeting, we have not been able to identify any off-site risks due to contaminant migration. The remedies now being proposed are directed at on-site risks. These actions are designed to ensure that there will be no off-site risks in the future and that even on-site risks will be eliminated. Bonneville recognizes that it needs to deliberate in undertaking these actions while moving ahead without undue delay.

The implementation of the remedy in the Ross Substation and Capacitor Yard is scheduled for fiscal year 1995. At this time, PCB equipment will be replaced and the PCB contaminated soil will be removed. The remedy for the Capacitor Testing Lab will be conducted concurrently with the remedy in the Ross Substation and Capacitor Yard. Planning for implementation of the remedy in the Wood Pole Storage Area East is currently

underway. The length of time to complete bioremediation is dependent on biological reactions. It cannot be accurately predicted although a treatment period of one to two years is anticipated.

2. **The public want to ensure that the clean-up process is not a temporary solution and that the problem is really resolved.**

Response:

As outlined in the proposed plan, in selecting a specific cleanup technology, we are required to consider a number of criteria. Among other things, we must evaluate the short-term effectiveness, long-term effectiveness, as well as overall reduction in mobility, toxicity, and volume of waste through treatment. Long-term effectiveness was a critical component in the evaluation for the selection of a remedy. The alternatives selected are intended to ensure that the solutions applied provide a permanent remedy.

3. **Institutional Controls appears to be the logical choice for containment. It does not disturb the soil and cause it to be air-borne, the cost is reasonable, and it is unlikely the land be open to a great deal of public use.**

Response:

Institutional Controls includes measures to limit or prohibit activities that may interfere with or disturb contaminated areas. We recognize that the cost for institutional control is reasonable; however, the use of this alternative would not allow BPA to have unrestricted access for incorporation of these areas into the long term planning and development process for the Ross Complex. Therefore, Alternatives I and C, were selected for the Wood Pole Storage Area East, Ross Substation and Capacitor Yard and Capacitor Testing Lab based on best the balance of trade offs resulting from the comparative analysis of alternatives and when implemented will allow BPA unrestricted use of these areas.

4. **The contaminants do not appear to be a problem. The following alternatives are preferred: 1) no action 2) institutional control, and 3) certainly nothing more costly than the Table 3 preferred alternatives.**

Response:

The preferred alternatives for the Wood Pole Storage Area and the Ross Substation and Capacitor Yard and associated costs presented in Table 3 were selected based on the best balance of tradeoffs among the alternatives evaluated including costs. The remedies selected accommodates regulatory treatment preferences and includes the evaluations of criteria such as effectiveness, implementability, and cost. The cost estimates have been refined since issuances of the Proposed Plan and they are significantly lower. BPA, therefore believes it makes sense to remove these known levels of contamination.

5. A concern related to all contaminants at Ross and many other areas of our community exists. Removal of all contaminants from the site is advocated.

Response: BPA, in working with EPA and the state, has utilized a risk-based clean up approach. When warranted this approach requires the removal of contaminants. In other situations, contaminants may be contained for the prevention of further migration. The interaction of these two approaches achieves the clean up requirements of EPA and the state which are protective of human health and the environment. Historical contamination is being addressed by the selected remedies. These remediations coupled with changes in the handling and storage practices which caused the contamination, discontinuing the use of certain hazardous compounds, and the development of new waste handling facility, will when taken together, represent the best way of reducing the potential for future contamination issues.

ATTACHMENT II
ADMINISTRATIVE RECORD LISTING

ATTACHMENT II

Administrative Record List

Title/Type	Date	Pages	Author/Organization
SITE IDENTIFICATION			
Background (Suspect Contamination)	7/1/89	15	US EPA
NFL Listing/Site Inspection	9/14/88	21	US EPA
Preliminary Assessment Report	4/1/86	50	BPA
Site Investigation (SI) Report	7/1/88	V I/II/III	Pacific NW Lab, Richland
REMEDIAL INVESTIGATION (RI)			
Work Plan (RI/FS Study) Vol I	6/1/91		Dames & Moore
Work Plan (RI/FS Study) Vol II	6/1/91		Dames & Moore
RI Work Plan Modification	8/1/91	7	Anthony Morrell, BPA
RI Operable Unit A Vol 1	5/15/92		Dames & Moore
RI Operable Unit A Vol 2	5/15/92		Dames & Moore
RI (Unit A) Appendices Volume 1	5/15/92		Dames & Moore
RI (Unit A) Appendices Volume 2	5/15/92		Dames & Moore
RI (Unit A) Appendices Volume 3	5/15/92		Dames & Moore
RI (Unit A) Appendices Volume 4	5/15/92		Dames & Moore
RI (Unit A) Appendices Volume 5	5/15/92		Dames & Moore
RI (Unit A) Appendices Volume 6	5/15/92		Dames & Moore
RI (Unit A) Appendices Volume 7	5/15/92		Dames & Moore
RI (Unit A) Appendices Volume 8	5/15/92		Dames & Moore
FEASIBILITY STUDY			
Feasibility Study Operable Unit A	7/22/92	200	Dames & Moore
Proposed Plan	8/11/92	13	BPA, EPA, Ecology
Ltr proposing enhanced bioremed.	2/12/93	4	Anthony Morrell, BPA
Ltr agree to enhanced bioremed.	2/19/93	2	Nancy Harney, U.S. EPA
Ltr agree to enhanced bioremed.	2/22/93	2	Chris Poindexter, Ecology
RECORD OF DECISION			
REMEDATION			
Removal Action Closure Report	8/24/92		Dames & Moore
COORDINATION			
Federal Facilities Agreement	3/1/90	60	BPA, EPA, Ecology
Transmit Site Inspection Report	8/8/89	1	Gloria Lenz, BPA
EPA's position re fieldwork act	6/15/90	1	Nancy Harney, U.S. EPA
BPA Commence Fieldwork	5/2/91	1	Nancy Harney, U.S. EPA
Transmits RI Report Operable Unit A	5/15/92	1	Anthony Morrell, BPA
EPA's Comments on Final RI	6/9/92	5	Nancy Harney, U.S. EPA
EPA's Accept RI Operable Unit A	6/23/92	1	Nancy Harney, U.S. EPA
Transmit Preliminary Assessment	7/11/86	1	Stephen Sander, BPA
Transmit Site Inspection Report	8/8/89	1	Gloria Lenz, BPA
Accepts RI/FS Work Plan	8/21/91	1	Chris Poindexter, Ecology
Request to Revise schedule	11/1/91	4	Anthony Morrell, BPA
Response to Concerned Citizen	2/3/92	2	Chris Poindexter, Ecology
Transmits RI Report Operable Unit A	5/15/92	1	Anthony Morrell, BPA
FFA Resolution of Disputes Alternate	6/1/92	1	Chris Poindexter, Ecology
Extension for Draft ROD	7/24/92	1	Chris Poindexter, Ecology

ATTACHMENT II

Administrative Record List

Title/Type	Date	Pages	Author/Organization
HEALTH ASSESSMENTS			
ATSDR Ltr enc IAG, schedule visit	2/28/92	33	Luther DeWeese ATSDR
PUBLIC PARTICIPATION			
Memo/Community Relations Plan	9/30/88	7	Asst to Adm. Environment
Community Relations Plan	5/1/90	8	BPA
Ross Community Contact List	11/30/89	5	BPA
Notice of 5/22/90 meeting	4/27/90	2	George Gwinnett, Area M
Ross Community Contact List	5/12/92	3	BPA
Official Comment Log Close 5/31/90	5/31/90	11	Comments 1-6
Ltr enclosing 5/22/90 question responses	7/12/90	1	John Straub, BPA
Ltr re Superfund Site information	11/16/90	1	John Straub, BPA
Ltr re Superfund Site Activities	3/27/91	1	John Straub, BPA
Ltr re Superfund Site Activities Update	5/21/91	1	John Straub, BPA
Ross Complex Dev Guide Info	3/1/92	2	BPA
Ltr re waste handling/site cleanup	4/13/92	2	Dave Dunahay, BPA
Ltr review proposed plan & public mtg	8/11/92	1	Dave Dunahay, BPA
Public Comment Log	9/14/92	5	Interested Neighbors
BPA Notice of Intent (RI/FS)	4/27/90	2	Federal Registrar (EIS)
Ross Complex Cleanup	5/17/90	1	The Columbian
Ross Complex Looks to Future	Jan-92	3	BPA
BPA Announces AR Avail Library	6/1/92	1	The Oregonian
BPA Announces AR Avail Library	6/1/92	1	The Columbian
BPA Announces AR Avail Library	6/15/92	1	The Columbian
BPA Announces AR Avail Library	6/15/92	1	The Oregonian
BPA's Superfund Proposal	8/24/92	1	The Columbian
BPA's Superfund Proposal	8/24/92	1	The Oregonian
Withdrawal of NOI to Prepare EIS	12/4/92	1	Federal Registrar (EIS)
EPA Releases BPA Superfund Shedule	7/8/90	1	EPA
BPA Site to be tested for hazards	9/30/84	1	The Columbian
Toxic contamination suspect BPA Sub	7/8/86	1	The Oregonian
Chemical tests to begin on BPA Site	7/9/86	1	The Oregonian
Ross tests trigger \$1.5 million study	10/9/88	1	The Oregonian
EPA stresses three sites for cleanup	7/14/89	1	Seattle PI
EPA plans to track pollutants	7/14/89	1	The Columbian
Seattle firm to test Bonneville pollution	10/22/89	1	The Oregonian
EPA adds BPA site to waste list	11/16/89	1	The Oregonian
Ross contamination still unclear	5/23/90	1	The Columbian
BPA plan will affect site near Hazel Dell	4/19/90	1	The Oregonian
BPA seeks comment on cleanup	8/20/92	1	The Oregonian
Ross Complex takes next step	8/20/92	1	The Columbian
Fact Sheet-Ross Needs a Cleanup	4/1/90	2	BPA
Fact Sheet-CERCLA Process	5/1/90	2	BPA
Fact Shet-Inspection Summary	5/1/90	4	BPA
Fact Sheet-May 22 Meet Q&A	7/1/90	4	BPA
Fact Sheet-What's Happening	3/1/91	1	BPA
Fact Sheet-Studies Begin	5/1/91	2	BPA
Fact Sheet-Update	8/1/91	1	BPA
Fact Sheet-What's Happening	May-92	2	BPA

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Administrative Record List

Title/Type	Date	Pages	Author/Organization
TECHNICAL SOURCES			
Summary of CERCLA	1986	30	
History & Statute	11/28/86	70	(Index and CERCLA Act)
EPA Final Rule (Fed Register)	3/8/90	55	
Technical Assistance Grant Update	2/1/90	1	EPA Region X
EPA Guidance for RI/FS Baseline	2/21/90	25	Nancy Harney, U.S. EPA
CERCLA Requirements	10/6/89	1	U.S. Dept. of Energy

RECORD OF DECISION
ORC Concurrence

Site Name: BPA/Ross Complex

INITIAL	<i>WA</i>	<i>RM</i>	<i>mk not change on pg 22</i>	<i>SK</i>	<i>GHF</i>
NAME	Harney	McAllister	Kirk	Kowalski	Fox
DATE	4/30/93	5/3/93	5/4/93	5/5/93	5/5/93

RECORD OF DECISION
HWD Concurrence

Site Name: BPA/Ross Complex

INITIAL	<i>MA</i>	<i>C. Payne</i>	<i>YH</i>	<i>RFS</i>	
NAME	Harney	Psyk	Hofer	Smith	
DATE	4/30/93	4/29/93	4/30/93	5/3/93	